

TM 11-2217

WAR DEPARTMENT TECHNICAL MANUAL

DISTORTION
TEST SET
TS-383/GG

TECHNICAL MANUAL

DISTORTION TEST SETS TS-383/GG, TS-383A/GG, AND TS-383B/GG

TM 11-2217

CHANGES No. 3

TM 11-2217, 16 October 1946, is changed as indicated so that the manual also applies to the following equipment:

<i>Nomenclature</i>	<i>Order No.</i>
Test Set TS-383B/GG---	26787-Phila-56 and 44631-Phila-56

Change the title of the manual to: **DISTORTION TEST SETS TS-383/GG, TS-383A/GG, AND TS-383B/GG.**

Note. The parenthetical reference to previous Changes (example: "page 1 of C 1") indicates that pertinent material was published in that Changes.

Page 1, Part One. Add the following note below the title of Part One:

Note. Distortion Test Sets TS-383A/GG and TS-383B/GG are similar to Distortion Test Set TS-383/GG. Information in this manual applies to all three sets unless otherwise specified.

Change "ac MOTOR POWER cord" to **motor**

Page 2. Delete paragraph 2 and substitute:

2. Table of Components

Quantity	Item	Test set		
		TS-383/GG	TS-383A/GG	TS-383B/GG
1	Main test unit.....	X	X	X
1	Motor, PU-93/TG (series-governed includes two spare contact brushes, Fed stk No. 5977-233-1030).	X		X
1	Motor, PD-22/UG (synchronous).....			X
1	Motor, MU-29 (dc shunt).....		X	
1	Gear set, 96572 (PU-93/TG and MU-29 at 368 opm) consisting of: Worm, 102667, 7 teeth. Gear, 102668, 40 teeth.	X	X	X
1	Gear set, 113210 (PU-93/TG and MU-29 at 600 opm) consisting of: Worm, 110898, 10 teeth. Gear, 110899, 35 teeth.	X	X	X
1	Gear set, 96473 (PD-22/UG at 368 opm) consisting of: Worm, 102662, 9 teeth. Gear, 102663, 44 teeth.			X
1	Gear set, 110897 (PD-22/UG at 600 opm) consisting of: Worm, 110899, 12 teeth. Gear, 110890, 36 teeth.			X
1	Hood, Sig C stk No. 96458.....		X	X
1	Extracting tool, Sig C stk No. 4T126812.....			X
1	Set spare parts, consisting of: 2 ea lamp, neon, ¼ watt. 1 ea electrical contact, Sig C stk No. 4T77038.	X	X	X
		X	X	X

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 1 May 1958

power cord and change "a suitable 110 to 115-volt, 50 to 60-cycle ac power source" to **a suitable power source (par. 5)** in the following places:

Page 8, paragraph 14b(1).

Page 11, paragraph 16a.

Page 12, paragraph 18b(2).

Page 12, paragraph 20a.

Page 1, paragraph 1 (page 1 of C 1). Make the following changes:

Delete the note.

Add the following after subparagraph a:

a.1. Official nomenclature followed by (*) is used to indicate all models of the equipment covered in this manual. Thus, Distortion Test Set TS-383(*)/GG refers to Distortion Test Sets TS-383/GG, TS-383A/GG, and TS-383B/GG.

a. 2. Forward all comments on this publication to Commanding Officer, U. S. Army Signal Publications Agency, Fort Monmouth, N. J.

Page 2, figure 3. Make the following changes:
Change "MOTOR ON-OFF TOGGLE SWITCH" to: **MOTOR SWITCH.**

Change "STOP PULSE OFF-ON SWITCH" to: **STOP PULSE SWITCH (NOT PART OF TS-383/GG).**

Change "STROBOSCOPE VIEW-TRANSMIT KEY" to: **VIEW-TRANSMIT KEY.**

Page 3, figure 4. Make the following changes:

Change "A-C MOTOR POWER CORD" to: **MOTOR POWER CORD.**

Page 5. Delete paragraph 5 and substitute:

5. Differences in Models

Item	Test set		
	TS-383/GG	TS-383A/GG	TS-383B/GG
Station identification portion of test message.	Includes identification letters DTS only.	Same as TS-383/GG-----	Station identification call letters adjustable to any combination of three letters.
STOP PULSE switch-----	Not included-----	Included-----	Included.
Type of motor-----	Series-governed (PU-93/TG)	Dc shunt (MU-29)-----	Series-governed (PU-93/TG) and synchronous (PD-22/UG).
Type of motor power required.	110- to 115-volt, 50- to 60-cycle ac or 110- to 120-volt dc.	110- to 130-volt dc-----	110- to 115-volt, 50- to 60-cycle ac or 110- to 120-volt dc (PU-93/TG); 110-volt regulated 60-cycle ac (PD-22/UG).
Dc power cords (signal circuit).	Not included-----	Includes two single-conductor dc power cords.	Same as TS-383A/GG.
Motor governor circuit-----	Includes two 300-ohm resistors.	Includes two 500-ohm resistors, one 250-ohm resistor, and one .01 mf capacitor.	Same as TS-383/GG.
Outer ring brake-----	Included-----	Not included-----	Not included.

Page 6, paragraph 9. Add the following after subparagraph f:

g. If the test set is found to be in a damaged condition after unpacking or if any components are missing, fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), Navy Shipping Guide, Article 1850-4 (Navy), and AFR 71-4 (Air Force).

Page 7. Add paragraph 11.1 and figure 5.1 after paragraph 11.

11.1. Test Message Station Call Letters (TS-383B/GG)

The inclusion of slotted test message code disks and interchangeable code disk segments (Fig.

Add the following note:

NOTE:

D-C CORDS NOT PART OF TS-383/GG.

Page 5, paragraph 4d. Make the following changes:

Line 4. Change "an ac power source" to: **the motor power source.**

Line 6. After "are provided" insert: **as parts of the TS-383A/GG and TS-383B/GG.**

32.1) in the TS-383B/GG permits the selection of any three code groups for the station identification portion of the test message. The test message transmitted is: THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 (three station call letters) SENDING. The test message is preceded by a letters code group and followed by two carriage-return code groups and one line-feed code group. The three station call letters are the 67th, 68th, and 69th code groups transmitted. The TS-383B/GG includes 30 code disk segments (5 of each of the 6 variations shown in B, figure 5.1). When preparing the test set for operation, refer to figure 5.1 and prepare a chart as described below to

determine which segments are to be used and how they are to be arranged in the code disks.

a. Enter the letter S in the appropriate columns of the chart for each spacing code impulse and the letter M for each marking code impulse of the code groups of the three station call letters selected. Refer to A, figure 5.1 to determine the code impulses of each call letter.

b. Record below each code impulse column the number of the segment which must be used to transmit the impulses listed in the column. Note that segments No. 126807 and 126808 are reversible and each may be used for two impulse patterns.

c. Insert the proper segment in each code disk. Use extracting tool 126812 when removal of inserted segments is necessary.

d. The following chart illustrates the selection of the segments for transmission of station call letters CTT.

Test message code group	Station call letters desired	Code impulses				
		1st (disk #1)	2d (disk #2)	3d (disk #3)	4th (disk #4)	5th (disk #5)
67th-----	C	S	M	M	M	S
68th-----	T	S	S	S	S	M
69th-----	T	S	S	S	S	M
Segment required....		126809	126808	126808	126808	126807

Page 7, paragraph 12. Make the following changes:

Subparagraph a. Delete subparagraph a and substitute:

a. Plug the motor power cord into a suitable source of power (par. 5).

Subparagraph c(1), line 6. Change "968.1" to: 368.1.

Page 10, paragraph 15a(5). Make the following changes:

In the right hand column, change OFF to ON. Delete the note and substitute:

Note: When the STOP PULSE switch is set to ON and the code selecting switch is set to T, a signal will be transmitted that will approximate the effect of a repeated space signal on the bias meter of the BE-77(*).

Page 11, paragraph 17b(2). Delete subparagraph (2) and substitute:

(2) Connect the motor power cord of the test set to a suitable power source (par. 5).

Page 14, paragraph 23, chart. Make the following changes:

In item column, items No. 1 and 14, change "Ac MOTOR POWER cord" to: **Motor power cord.**

In action or condition column, item No. 1, change "110 to 115-volt 50 to 60-cycle ac supply" to: **a suitable power source (par. 5).**

Page 32, paragraph 50. Make the following changes in subparagraph c:

Line 26. Delete "(code signal)" and substitute: (or station call letters).

Line 27. Change the end of the last sentence to read: **followed by two carriage-return and one line-feed code combinations.**

Add the following note after subparagraph c:

Note. The letters DTS are the station call letters of the TS-383/GG and TS-383A/GG and they are not changeable. The station call letters of the TS-383B/GG may be adjusted to any three code combinations as determined by the user (par. 11.1).

Page 32, paragraph 51e, heading. Change "MOTOR ON-OFF Toggle Switch" to: **MOTOR Switch.**

Page 33, paragraph 51h, line 7. After "DTS" add: (or station call letters).

Page 35, paragraph 51i, heading. Change "STOP PULSE ON-OFF Switch" to: **STOP PULSE Switch.**

Page 57, appendix II, paragraph 2, heading (page 9 of C 1). Add the following note below the heading:

Note. Parts listed below and illustrated in figures 29 and 31 and which are available in various paint finishes are identified by a reference designation followed by two asterisks. To obtain the complete reference designation of a part in a specific finish, replace the asterisks with the appropriate pair of letters from the following chart.

Finish	Nonfungus treated	Fungus treated
Black wrinkle-----	AA	XA
Black semigloss-----	BB	YB
Black high-gloss-----	BA	YA
Light gray, smooth-----	BR	YR
Medium gray, smooth-----	BS	YS
Dark gray, smooth-----	BJ	YJ
Gray-green wrinkle-----	AB	XB
Dark brown wrinkle-----	AD	XD

LETTERS	DISK NO.1	DISK NO.2	DISK NO.3	DISK NO.4	DISK NO.5
A	M	M	S	S	S
B	M	S	S	M	M
C	S	M	M	M	S
D	M	S	S	M	S
E	M	S	S	S	S
F	M	S	M	M	S
G	S	M	S	M	M
H	S	S	M	S	M
I	S	M	M	S	S
J	M	M	S	M	S
K	M	M	M	M	S
L	S	M	S	S	M
M	S	S	M	M	M
N	S	S	M	M	S
O	S	S	S	M	M
P	S	M	M	S	M
Q	M	M	M	S	M
R	S	M	S	M	S
S	M	S	M	S	S
T	S	S	S	S	M
U	M	M	M	S	S
V	S	M	M	M	M
W	M	M	S	S	M
X	M	S	M	M	M
Y	M	S	M	S	M
Z	M	S	S	S	M
BLANK	S	S	S	S	S
LETTERS	M	M	M	M	M
FIGURES	M	M	S	M	M
SPACE	S	S	M	S	S
C.R.	S	S	S	M	S
L.F.	S	M	S	S	S

COUNT DISKS FROM BACK TO FRONT.
NO.5 DISK IS TOWARD FRONT OF UNIT.

S = SPACE
M = MARK

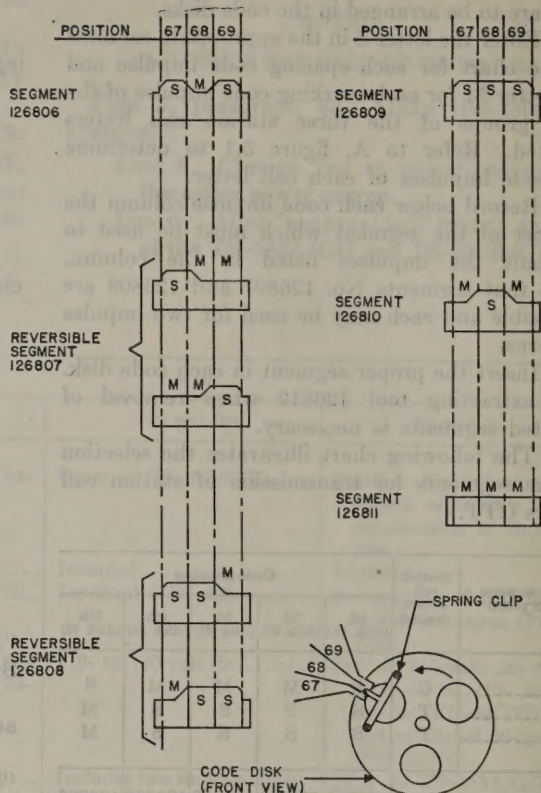


Figure 5.1. Code disk segment data (TS-383B/GG).

Page 57, paragraph 2 (page 12 of C 1). Make the following changes in the reference symbol column:

Delete "92348" and substitute: 121479**.
Delete "92349" and substitute: 121484**.
Delete "92352" and substitute: 121481**.
Delete "92353" and substitute: 121485**.
Delete "92384" and substitute: 121482**.
Delete "92385" and substitute: 121483**.
Delete "92401" and substitute: 121486**.
Delete "96458" and substitute: 121480**.

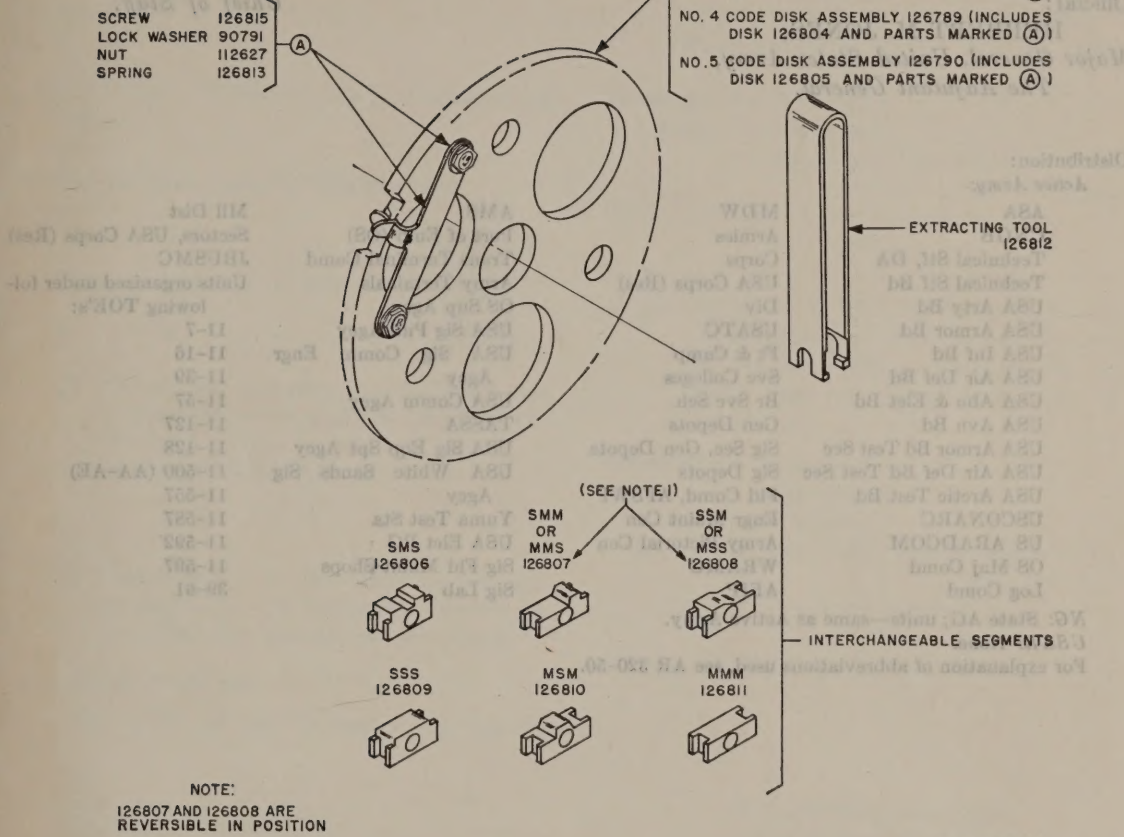
Page 60, figure 29 (page 14 of C 1). Make the following changes:

Delete "92384" and substitute: 121482**.
Delete "92401" and substitute: 121486**.
Delete "92348" and substitute: 121479**.
Delete "92349" and substitute: 121484**.
Delete "92353" and substitute: 121485**.
Delete "92385" and substitute: 121483**.

Page 62, figure 31 (page 15 of C 1). Make the following changes:

Delete "96458" and substitute: 121480**.
Delete "92353" and substitute: 121485**.
Delete "92352" and substitute: 121481**.

Page 63, Add figure 32.1 after figure 32.



TM2217-C3-2

Figure 32.1. Test message code disk parts, TS-383B/GG.

[AG 413.44 (19 Mar 58)]

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US ARADCOM	Army Pictorial Cen	USA Elct PG	11-592
OS Maj Comd	WRAMC	Sig Fld Maint Shops	11-597
Log Comd	AFIP	Sig Lab	39-61

NG: State AG; units—same as Active Army.

USAR: None.

For explanation of abbreviations used, see AR 320-50.

TECHNICAL MANUAL

DISTORTION TEST SETS TS-383/GG AND TS-383A/GG

CHANGES }
No. 2 }

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 14 April 1950

TM 11-2217, 16 October 1946, is changed as follows:

Maximum end distortion=

Upper limit spacing

end distortion—Lower limit marking
end distortion

$$35 + \frac{\quad}{2}$$

* * * * *

- (7) (Superseded) Use the following formula to determine the correct orientation point for the range finder of the selector unit under test on signals containing end distortion:

Optimum setting for end
distortion=

Upper limit spacing

end distortion+Lower limit marking
end distortion

$$\frac{\quad}{2}$$

* * * * *

4. Test of Teletypewriter Selector Unit

* * * * *

e. TEST FOR MAXIMUM END DISTORTION

* * * * *

- (2) Adjust the distortion control until the marking impulses each occupy 135 scale divisions. The signals will * * * marking end distortion.

* * * * *

- (5) (Superseded) Use the following formula to determine the maximum amount of end distortion the unit can withstand:

[AG (413.44 (31 Mar 50))]

BY ORDER OF THE SECRETARY OF THE ARMY:

OFFICIAL:

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Major General, USA
The Adjutant General

J. LAWTON COLLINS

Chief of Staff, United States Army

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For explanation of distribution formula see SR 310-90-1.

TECHNICAL MANUAL

DISTORTION TEST SETS TS-383/GG AND TS-383A/GG

CHANGES }
No. 1 }

DEPARTMENT OF THE ARMY
Washington 25, D. C., 18 November 1948

COPYRIGHT NOTICE: These changes include information contained in *Teletype Bulletin 1079, Issue 2, June 1947 and Correction Sheet EE-506, Issue 1, August 1945*, copyrighted 1945 and 1947 by Teletype Corporation.

TM 11-2217, 16 October 1946, is changed as follows:
The title is changed to read:

DISTORTION TEST SETS TS-383/GG AND TS-383A/GG

Figure 1. Distortion Test Set TS-383(★)/GG in use with teletypewriter equipment.

Section I. DESCRIPTION OF DISTORTION TEST SETS TS-383/GG AND TS-383A/GG

1. General

a. Distortion Test Set TS-383(★)/GG is a portable, motor-driven teletypewriter signal distortion test set. Prior to the * * * DXD1 or DXD4. **A later model of the test set is the DXD5. Operationally, these three models of Distortion Test Set TS-383(★)/GG are the same.**

Note (Added). In the text, Distortion Test Set TS-383(*)/GG designates Distortion Test Set TS-383/GG or TS-383A/GG. Distortion Test Set TS-383A/GG (serial numbers 1 through 48), was procured on Order No. 9715-Phila-48.

* * * * *
Figure 2. Distortion Test Set TS-383(★)/GG, front view with hood.

Figure 3. Distortion Test Set TS-383(★)/GG, front view, hood removed.

Figure 4. Distortion Test Set TS-383(★)/GG, rear view.

3. Packaging (Superseded.)

a. For both domestic and oversea shipment, Distortion Test Set TS-383(*)/GG is packed as follows:

(1) The hood is wound with cellulose wadding and is packaged with the electrical accessories,

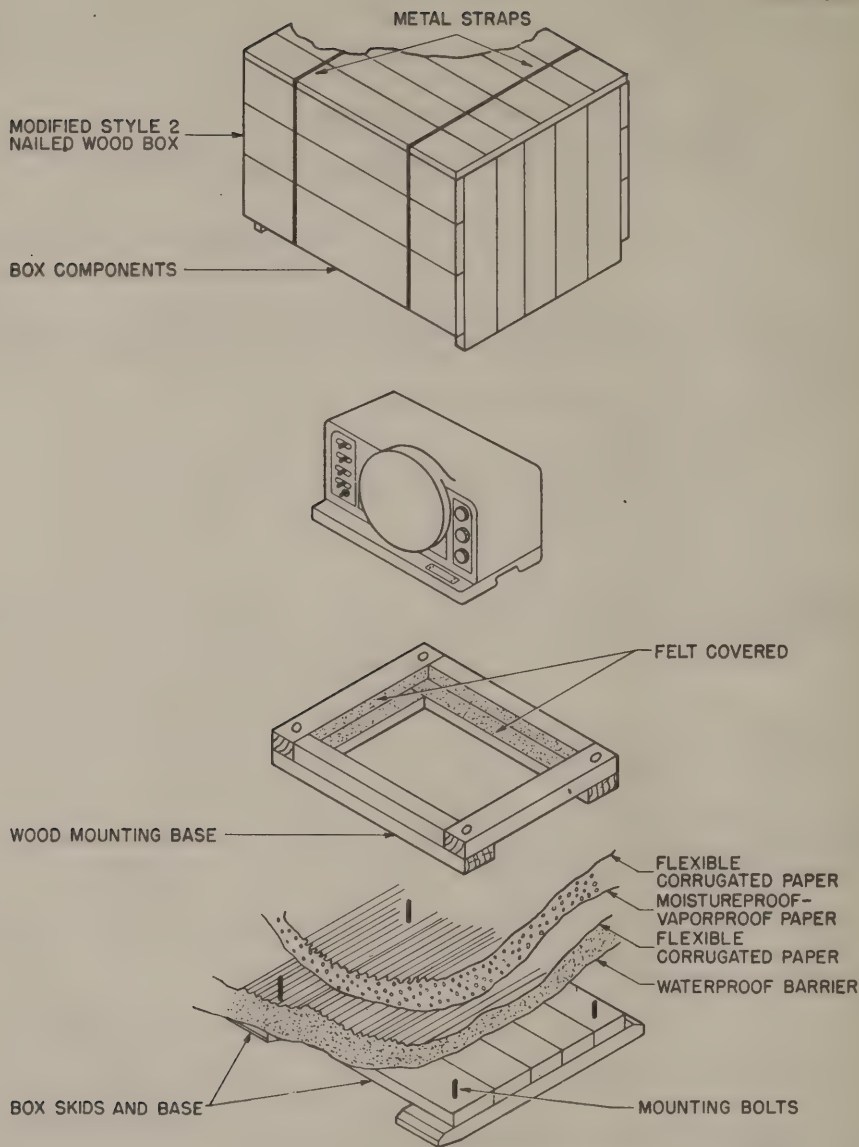
spare parts, and technical manuals in a fiberboard box sealed with gummed tape. Cellulose wadding prevents the contents from shifting.

(2) The interior of the test set is blocked and braced to prevent stress on mountings and movement or shifting during shipment. The cords are rolled individually and tied with cotton tape. The outside of the test set, except the base, is blanketed with cellulose wadding, and the test set is fastened to a wooden mounting base with flat metal straps. The fiberboard box containing the hood is secured in place on top of the rear cover of the test set with flat metal bands or cotton tape.

(3) The mounted test set is packed in a wooden container. A barrier consisting of a waterproof barrier, a cushioning shroud, a moistureproof-vaporproof barrier, and another cushioning shroud is placed over mounting bolts which protrude through the skids and base of the wooden box, and the barrier is sealed around the bolts with cement. The mounted test set is positioned over the mounting bolts and fastened securely in place. Desiccant is taped to the test set, the barrier sealed, and the box closed.

(4) The wooden box containing the test set is overpacked in a nailed wooden packing case lined with excelsior.

b. For oversea shipment only, the shipping container is reinforced with steel straps.



TM 2217-CI-15

Figure 5. (Superseded.) Distortion Test Set TS-383(*)/GG packaged for oversea shipment.

4. Physical Description

a. Distortion Test Set TS-383(★)/GG is a self-contained unit 19 inches long, 13½ inches high, and 14 inches deep. It weighs 125 * * * the test set.

* * * * *

5. Differences in Models

a. STOP PULSE TOGGLE SWITCH. Late DXD1 models and all DXD4 and DXD5 models of Distortion Test Set TS-383(★)/GG have a toggle switch on the right-hand control panel for disconnecting the stop pulse. This permits transmitting * * * this toggle switch.

b. 115-V D-C CORDS. All DXD1 models * * * for the stroboscope. DXD4 and DXD5 models of Distortion Test Set TS-383(★)/GG are equipped with two single-conductor cords, one with a red plug for negative 115-volt dc and one with a black plug for positive 115-volt dc.

c. MAIN SHAFT. (1) On the main shaft, the gear used in early DXD1 models of the test set has been replaced in late DXD1 and in all DXD4 and DXD5 models with a 44T gear if the unit is equipped with a synchronous motor, or a 40T gear if the unit is equipped with a governed motor. The hub used * * * into the gear.

(2) A reverse rotation stop, mounted on the main shaft at the rear of the frame, has been added in late DXD1 and in DXD4 and DXD5 models of the test set. This stop prevents * * * the brush arm.

* * * * *

e. RESISTOR. A 240,000-ohm resistor has been added across the contact springs of the LINE-DIST key on late DXD1 models and on all DXD4 and DXD5 models.

f. HOOD. A cylindrical hood is supplied with DXD4 and DXD5 models of the distortion test set to improve the visibility of the signals. The hood fits * * * distortion measuring scale.

* * * * *

Section II. APPLICATION OF DISTORTION TEST SET TS-383(★)/GG

6. Application

a. PRINCIPAL USES. The principal uses of Distortion Test Set TS-383(★)/GG are:

* * * * *

b. USE WITH ALLIED EQUIPMENT. Distortion Test Set TS-383(★)/GG is designed and built to conform with the normal American speed of 368.1 opm with 7.42-unit code length. The British code * * * (See par. 12.)

11. Preparation for Use

Before attempting to place Distortion Test Set TS-383(★)/GG into operation, carefully read the instructions covering its use. Be sure to * * * protect the equipment. Distortion Test

Set TS-383(★)/GG normally is adjusted at the factory before being packed for shipment. Before any test * * * should be made.

* * * * *

12. Starting Distortion Test Set TS-383(★)/GG

* * * * *

13. Operation of Distortion Test Set TS-383(★)/GG

This section gives a detailed step-by-step outline for operating Distortion Test Set TS-383(★)/GG. The tests outlined are:

* * * * *

14. Test of Teletypewriter Selector Unit

* * * * *

b. CONNECTIONS.

* * * * *

(7) Turn the MOTOR switch of Distortion Test Set TS-383(★)/GG to ON.

* * * * *

c. TEST FOR ZERO BIAS. (1) To test teletypewriter apparatus locally for zero bias, place the keys and switches of Distortion Test Set TS-383(★)/GG in the following positions:

* * * * *

d. TEST FOR MAXIMUM BIAS. (1) To determine the maximum bias the receiving selector will permit, place the keys and switches of Distortion Test Set TS-383(★)/GG in the following positions:

* * * * *

15. Test of Bias Meters

a. LINE UNIT BE-77-().

* * * * *

(3) Connect alligator clips to a length of two-conductor cord, and connect the SIGNAL LINE cord of Distortion Test Set TS-383(★)/GG to the cord with a suitable female plug. Fasten the clips * * * Line Unit BE-77-().

* * * * *

(5) Set the keys and switches on Distortion Test Set TS-383(★)/GG as follows:

* * * *

(7) With Distortion Test Set TS-383(★)/GG transmitting undistorted signals, the bias meter should indicate zero. If it does * * * the adjusting screw.

b. SWITCHBOARD BD-100.

* * * *

(2) Connect Distortion Test Set TS-383 (★)/GG to the bias meter circuit of the switchboard by plugging the SIGNAL LINE cord into the bias meter jack of the switchboard.

* * * *

(4) Set the keys and switches on Distortion Test Set TS-383 (★)/GG to the following positions:

* * * *

(6) With Distortion Test Set TS-383 (★)/GG transmitting undistorted signals, the bias meter should indicate zero. If the meter * * * bias is obtained.

16. Test of Test Set TS-2/TG

Distortion Test Set TS-383 (★)/GG may be used to check various operations of Test Set TS-2/TG. When performing any * * * the impulse length.

* * * *

e. Place the keys and switches on Distortion Test Set TS-383 (★)/GG in the following positions:

* * * *

g. If governed motors are used and the signal trace on the stroboscope of Distortion Test Set TS-383 (★)/GG appears to creep, adjust the motor speeds of the two test sets to be as **near** identical as possible. (See par. 12.)

17. Test of Carrier Telegraph Terminals and Repeaters

a. GENERAL. Test Set TS-383 (★)/GG may be used to transmit unbiased or biased teletype-

writer signals in making operational tests of carrier telegraph terminals and repeaters. In making these * * * terminal or repeater.

b. CONNECTIONS.

* * * *

(2) Connect the a-c MOTOR POWER cord of Distortion Test Set TS-383(★)/GG to the convenience outlet on the carrier telegraph equipment in good operating condition.

* * * *

c. TEST. (1) With the keys and switches on Distortion Test Set TS-383 (★)/GG in the positions listed below, send from the test set and measure the range of orientation of the teletypewriter. This range should * * * in proper condition.

* * * *

(2) Reverse the direction of transmission and, with the key and switch settings on Distortion Test Set TS-383(★)/GG changes as follows, repeat the measurement.

* * * *

18. Test of Polar Relays

a. GENERAL. Polar relays may be tested for faulty operation with Distortion Test Set TS-383(★)/GG by comparing the signals obtained locally with the signals after they have passed through the relay. The signals transmitted * * * the stroboscope lamp.

b. CONNECTIONS.

* * * *

(2) Connect the a-c MOTOR POWER cord of Distortion Test Set TS-383(★)/GG to a source of 110- to 115-volt, 50- to 60-cycle ac.

* * * *

c. TEST. (1) Supply external line * * * and the stroboscope. To view the input and output signals of the relay, set the keys and switches on Distortion Test Set TS-383(★)/GG in the following positions:

* * * *

19. Test of Relay BK-27-A

Distortion Test Set TS-383(★)/GG may be used, with special circuits, for a very accurate check on the adjustments of Relay BK-27-A. Directions for constructing * * * with Switchboard BD-100.

20. Test of Transmitting Contacts of Teletype-writers

a. Connect the a-c MOTOR POWER cord of Distortion Test Set TS-383(★)/GG to a source of 110- to 115-volt, 50- to 60-cycle ac.

* * * *

d. With external battery supplied for the transmitting contacts and the stroboscope, set the keys and switches on Distortion Test Set TS-383(★)/GG in the following positions:

* * * *

22. Purpose and Use of Equipment Performance Check List

a. GENERAL. The equipment performance check list (par. 23) will help in determining whether Distortion Test Set TS-383(★)/GG is functioning properly. The check list * * * the test set.

* * * *

23. Equipment Performance Check List for Distortion Test Set TS-383(★)/GG

* * * *

38. Preventive Maintenance Tools and Materials

* * * *

b. TOOLS.¹ All required tools * * * of teletypewriter equipment. Tool Equipment TE-50 is available to personnel of organizations

to which Distortion Test Set TS-383(★)/GG is issued.

* * * *

39. Preventive Maintenance Check List for Distortion Test Set TS-383(★)/GG

The following check list is a summary of the preventive maintenance to be performed on Distortion Test Set TS-383(★)/GG. The time intervals * * * normal daily use. When equipment is operated under extreme climatic and temperature conditions, the intervals of preventive maintenance inspection and procedures should be more frequent than under temperate conditions. Under these special conditions, the intervals may be changed by the local commander. For best performance * * * and adjusted (A).

* * * *

40. Approved Lubricants and Cleaners for Distortion Test Set TS-383(★)/GG

The following table lists the lubricating and cleaning materials necessary for servicing Distortion Test Set TS-383(★)/GG.

Symbol	Standard nomenclature
* PL*	* * * * Oil, lubricating, preservative, special.
*	* * * *

*When the temperature is so high that special preservative lubricating oil (PL) runs off the parts, engine oil (OE) may be used in place of oil (PL).

41. Detailed Lubrication Instructions

a. GENERAL. The lubrication instructions * * * may be required. The location of the parts of Distortion Test Set TS-383 (★)/GG are shown in figure 8. The type of * * * dry, and relubricate.

* * * *

e. LUBRICATION CHART.

Item No.*	Name of part	Lubricant	Method and quantity
*	* * *	*	*
2	Code disk oil wick----	GL	Saturate.
3	Code disk shaft bearings.	GL	One or two drops to bearings at each end.
*	* * *	*	*
5	Code selecting cylinder.	PL	One drop to bearings at each end.
*	* * *	*	*
7	Contact levers (five or six).	PL	One drop to bearings and at each shield spring.
8	Contact lever bail shaft.	PL	One or two drops to bearing at each end.
9	Distortion adjusting gear bearings.	PL	One to two drops to each bearing.
*	* * *	*	*
11	Friction washers-----	PL	Saturate.
*	* * *	*	*
13	Intermediate shaft----	PL	Three or four drops in end of intermediate shaft.
*	* * *	*	*
18	RUN-STOP switch shaft bearing.	PL	One or two drops to oiler in bearing.
19	Stop contact lever bearing.	PL	One drop to lever bearing.
20	Stop contact lever latch bearing.	PL	One drop to lever latch bearing.
*	* * *	*	*
23	Reverse rotation stop wedge bearing.	PL	One drop to wedge bearing.

* Item number refers to figure 8.

Figure 8. Distortion Test Set TS-383(★)/GG showing lubrication points.

Section X. WEATHERPROOFING

42. (Superseded) General.

Signal Corps equipment, when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

43. (Superseded) Tropical Maintenance.

a. GENERAL. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is explained fully in TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, and TB SIG 72, Tropical Maintenance of Ground Signal Equipment.

b. TREATING DISTORTION TEST SET TS-383(*)/GG. (1) Distortion Test Set TS-383(*)/GG has been moistureproofed and fungiproofed by the manufacturer. Therefore, no further re-treatment is required for new equipment. Equipments which have been treated have been marked with the letters MFP and the date of treatment. Equipments not marked will be examined and, if treatment has not been applied, the equipment will be returned to base maintenance units for treatment.

(2) Re-treatment may be required after a period of use. Need for this re-treatment is indicated by excessive failures or by the effects given in paragraph 42. See TB SIG 13 for a detailed description of this treatment. Special instructions applicable to Distortion Test Set TS-383(*)/GG, when being re-treated, are as follows:

- Mask all code disk contacts.
- Mask all key contacts.
- Mask motor terminal block slip contacts.
- Mask all gears.
- Mask edges of code disks.
- Mask stop contact assembly and contacts.
- Mask code cylinder.
- Mask all bearing surfaces.
- Mask governor contact brush and contact disk.
- Do not treat motor.

44. Treating Distortion Test Set TS-383/GG

Rescinded.

45. Moistureproofing and Fungiproofing After Repairs

* * * * *

45.1 Winter Maintenance (Added)

a. GENERAL. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low tempera-

tures are explained fully in TB SIG 66; Winter Maintenance of Signal Equipment.

b. DISTORTION TEST SET TS-383(*)/GG. Distortion Test Set TS-383(*)/GG will perform satisfactorily in low temperatures provided precautions are taken to prevent equipment failure. The test set should be used, if possible, in a heated room. When the test set is used in cold temperatures the following problems may be encountered:

(1) Steel shrinks and becomes brittle when subjected to the cold.

(2) Carbon brushes tend to wear out and become powdery more rapidly than under normal operating conditions.

(3) Lubricants become stiff, causing moving parts to drag and stick. See paragraphs 40 and 41 for lubrication instructions for Distortion Test Set TS-383(*)/GG.

(4) Capacitors absorb moisture when subjected to temperature variations.

Note. Give special attention to carbon brushes, capacitors, coils, and plugs.

45.2 Desert Maintenance (Added)

a. GENERAL. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are fully explained in TB SIG 76, Desert Maintenance of Ground Signal Equipment.

b. DISTORTION TEST SET TS-383(*)/GG. Special dustproofing treatment is not necessary for Distortion Test Set TS-383(*)/GG. Take all possible precautions to keep dust, dirt, and sand from getting on lubricated parts. Daily inspection and cleaning of the equipment is strongly recommended. Instead of merely adding new lubricants at regular intervals, clean and relubricate the equipment whenever practicable.

45.3 Lubrication Under Extreme Temperature Conditions (Added)

The effects of extreme cold and heat on materials and lubricants are explained in TB SIG 69, Lubrication of Ground Signal Equipment. Observe all precautions outlined in TB SIG 69 and pay strict attention to all lubrication instructions when operating equipment under conditions of extreme cold or heat.

48. Introduction to Detailed Functioning

This section explains in detail the mechanical functioning of the various parts, assemblies, and circuits of Distortion Test Set TS-383(★)/GG. It also explains * * * parts or assemblies.

Figure 10. Distortion Test Set TS-383 (★)/GG, distributor and brush arm assembly.

Figure 11. Distortion Test Set TS-383(★)/GG, code disk transmitter assembly.

55. Test Sets

a. VOLTOHMMETERS AND MILLIAMMETERS. Any common voltohmmeter or milliammeter is satisfactory for testing current flow, continuity, resistance, or voltage in Distortion Test Set TS-383 (★)/GG. When a voltohmmeter * * * with the set.

* * * *

56. Introduction to Trouble Shooting

a. GENERAL. A thorough knowledge of the functioning of each unit of Distortion Test Set TS-383(★)/GG is of fundamental importance in analyzing trouble. The maintenance man * * * to do so.

* * * *

58. Localizing Mechanical Troubles

Mechanical faults may develop in Distortion Test Set TS-383(★)/GG, but little trouble should be experienced in localizing them if the logical sequence of checks outlined below is followed.

* * * *

Figure 20. Distortion Test Set TS-383(★)/GG, right rear view, cover removed.

59. Trouble Analysis Chart

The most common trouble conditions that occur in Distortion Test Set TS-383(★)/GG, together with a listing of the probable causes, are given in the chart below. This list of * * * to other paragraphs.

* * * *

60. General Repair Information

a. Removal and replacement of defective parts or circuit elements of Distortion Test Set TS-383(★)/GG is not difficult. With the face * * * and circuit elements. Except in cases of extreme emergency, only fully qualified personnel should attempt any repair to Distortion Test Set TS-383(★)/GG.

b. Always use the * * * in disassembly procedures. Tool Equipment TE-50, available to personnel of organizations to which Distortion Test Set TS-383(★)/GG is issued, is adequate for all repair requirements except for major motor repairs.

* * * * *

63. Removing Motor from Distortion Test Set TS-383(★)/GG

* * * * *

79. Painting and Refinishing

If the finish on the metal case of Distortion Test Set TS-383(★)/GG has been badly scarred or damaged, touch up the bared metal surface to prevent rust and corrosion.

* * * * *

Figure 21. Distortion Test Set TS-383(★)/GG, left rear view, cover removed.

Figure 22. Distortion Test Set TS-383(★)/GG, top rear view, cover removed.

Figure 23. Distortion Test Set TS-383(★)/GG, transmitting contact requirements.

Figure 24. Distortion Test Set TS-383(★)/GG, stop contact requirements.

Figure 25. Distortion Test Set TS-383(★)/GG, front view, face plate removed.

APPENDIX II

MAINTENANCE PARTS

1. (Superseded.) Maintenance Parts for Distortion Test Set TS-383(★)/GG.

The following information was compiled on 14 April 1948. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1.

2. (Superseded.) Numerical List of Parts for Distortion Test Set TS-383(★)/GG (Sig C Stock No. 3F4312)

Figure No.	Reference symbol	Name
33.2	MU4	MOTOR UNIT, synchronous.
36.2	MU26	MOTOR UNIT, governed.
36.4	MU29	MOTOR UNIT, governed.
34, 35, 36	W-6104	NUT.
33	34-1	NUT.
32, 33, 33.1, 36, 36.1, 36.3, 40.	34-4	NUT.
29	34-56	NUT.
37	34-59	NUT.
32	35-26	SPRING.
32	35-43	SPRING.
33	35-54	SPRING.
29	103-27	WASHER.
41	122-276	STRAP.
30	122-589	SPACER.
41	123-244	WASHER.
30	400-3	BRUSH.
32	500-205	SPRING, contact.
32	1012	SCREW, shoulder.
30, 32, 33, 41.	1026	SCREW.
42, 42.1	1028	SCREW.
30, 41	1051	SCREW.
40	1064	SCREW.
36.1, 36.3	1100	SCREW.
33	1109	SCREW.
41	1113	SCREW.
30, 32, 33, 41.	1161	SCREW.
30	1162	SCREW.
29	1163	SCREW.
29	1166	SCREW.
38	1168	SCREW.
41	1169	SCREW.
33.1, 36	1179	SCREW.
32	1214	SCREW.
39	1266	SCREW.

Figure No.	Reference symbol	Name
32	1269	SCREW.
37	1272	SCREW.
36.3	1297	SCREW.
30	2034	WASHER.
29, 30, 32, 33, 33.1, 36, 36.1, 36.3, 38-41.	2191	WASHER, lock.
33	2422	WASHER, lock.
42, 42.1	2438	WASHER.
33, 33.1, 36, 36.1, 36.3, 41.	2449	WASHER, lock.
30, 32, 33, 33.1, 36, 36.1, 36.3, 37.1, 37.3, 40-42, 42.1.	2669	WASHER, lock.
33.1, 36, 36.1, 36.3.	2846	WASHER.
41	3043	RESISTOR: 250 ohms.
41	3094	INSULATOR.
32	3145	PLATE, stop.
32	3153	POST.
33	3339	WASHER, lock.
33, 36.3, 40	3438	WASHER.
29, 39	3598	NUT.
29, 30	3599	NUT.
33	3618	INSULATOR.
29, 30, 33, 36.3, 40-42, 42.1.	3640	WASHER, lock.
33	3647	INSULATOR.
33	3870	SPRING.
32	4429	SPRING.
33	4814	WASHER, lock.
42, 42.1	4871	BOLT.
37	5061	BEARING, ball.
30	5446	SCREW.
29	5702	KEY.
40	6314	SPRING ASSEMBLY, contact.
40	6318	CLAMP.
40	6319	BLOCK.
40	6320	SCREW, contact.
40	6323	SPRING.
40	6324	WHEEL, adjusting.
40	6330	BEARING ASSEMBLY: (upper and lower).
10	6340	WASHER, lock.
40	6344	SCREW.
40	6345	NUT.
40	6347	SCREW.
40	6348	SCREW.

Figure No.	Reference symbol	Name	Figure No.	Reference symbol	Name
41	6745	SCREW.	37.1	73238	CORE ASSEMBLY, field: (with coils and insulation).
33.1, 36.1, 36.3, 38, 41.	6746	SCREW.	37.1	73239	ARMATURE.
32	6807	SCREW, set.	37	73240	CORE, field.
33.1, 36, 36.1, 36.3, 40, 41.	6811	SCREW, mounting.	37	73241	COIL, field.
40	6979	HUB.	37, 37.1, 37.3	73242	INSULATION.
30, 32, 33, 33.1, 36, 36.1, 36.3, 38, 39, 41.	7002	WASHER.	37	73243	WEDGE, locking.
33	7048	SCREW.	37	73244	SCREW.
36.1, 36.3, 40.	7105	TARGET.	42, 42.1	73357	TERMINAL END ASSEMBLY.
33	7415	NUT.	31	73497	PLUG: (red shell).
36.1, 36.3	7661	LEVER, adjusting.	37	73595	WASHER, lock.
37	8094	BRUSH: (with spring).	33, 39	74059	SCREW.
40	8165	WASHER.	33.1, 36, 36.1, 36.3.	74091	PLATE, motor.
36.1, 36.3	8222	STRIP, wearing.	41	74514	SCREW.
41	8254	CLAMP, cable.	32	74547	COLLAR.
29	8262	KNOB, key.	33.1, 36, 36.1, 36.3.	74567	SCREW.
36.1, 36.3	8330	WASHER.	33	74717	SCREW.
30, 31	8543	SCREW.	30, 33	74805	SCREW.
33.1, 36, 36.1, 36.3.	8884	BLOCK, terminal.	33.1, 36, 36.1, 36.3.	74991	INSULATOR.
41	34432	WASHER.	29	75646	SCREW, drive.
41	35503	FOOT: rubber.	41	75750	WASHER.
39	36273	WASHER.	33	76084	WASHER, friction.
33, 38	41732	PLATE, clamping.	33	76085	DISK, friction.
33, 38	41733	INSULATOR.	33	76086	SPRING, friction.
30	43816	SCREW.	33	76087	NUT.
37.2	62135	SCREW.	41	76117	TERMINAL BLOCK MOUNT- ING ASSEMBLY.
33	70497	NUT.	30	76323	BUSHING.
42.1	70722	RESISTOR: 500 ohms.	30	76377	BUSHING.
42, 42.1	70724	INSULATOR.	33.1, 36	76484	FAN.
37, 37.4, 37.5.	70771	OILER.	33	77038	SPRING, contact: (long).
37	70872	HOLDER, brush: (with insula- tor).	32	77054	STUD.
37	70873	CAP, brush holder.	30	77063	SCREW.
42, 42.1	70887	NUT.	36.3	77128	WASHER.
33	71156	SHIM.	41	77902	SCREW.
37	71189	RETAINER, bearing.	39	77911	HOLDER, brush cap.
37	71998	RING, brush holder: (with 80706 screws).	36.1, 37	77953	MOTOR UNIT, governed.
37	71999	SPRING, end play.	41	78011	CAPACITOR: 1 mf.
33	72565	WASHER, lock.	35-37	78025	SCREW.
36.3, 37	72586	MOTOR UNIT, governed.	30, 39	78028	SCREW.
37	72587	ARMATURE.	41	87103	SCREW.
40	72835	POINT, contact.	42	78205	RESISTOR: 300 ohms.
29	73180	SWITCH, toggle.	37	78239	ARMATURE.
37	73231	RETAINER, bearing.	37, 37.3	78240	CORE, field.
37	73232	WASHER.	37, 37.3	78241	COIL, field.
30	73235	SCREW.	37.1, 37.3	78245	SCREW.
37	73236	FRAME, field: (with 70771 oiler).	32, 33, 33.1, 36, 36.1, 36.3, 41.	78301	SCREW.
37	73237	SHIELD, end: (with 70771 oiler).	38	78398	BUSHING.
			38	78399	SPRING, brush: outer disk; (with brush).
			38	78400	SPRING, brush: inner disk; (with brush).
			38	78403	BRUSH, contact.

Figure No.	Reference symbol	Name	Figure No.	Reference symbol	Name
41	78430	CLAMP, cable.	36.3	83384	RESISTOR: 70 ohms.
40	78437	INSULATOR.	36.3	82285	RESISTOR: 300 ohms.
40	78438	BUSHING.	37.1, 37.2,	82288	SCREW.
40	78439	SHELL, governor.	37.3.		
40	78443	DISK, outer contact.	33	82425	LEVER.
40	78451	COVER, governor.	36.1, 39	82440	SCREW.
29	78469	BUMPER.	31, 39	82474	TERMINAL.
40	78496	SPRING, contact: outer disk.	41	82559	BUSHING.
40	78497	SPRING, contact: inner disk.	33, 39	82702	SCREW.
39	78905	WASHER.	35, 36	82839	ROTOR ASSEMBLY: (with bearings and switch).
33	79509	SPRING, contact: short.			
33	79513	PLATE, clamp.	35, 36	82840	ROTOR ASSEMBLY.
33	79516	SHIELD, contact.	35, 36	82841	COMMUTATOR, switch.
33	79517	STIFFENER.	35, 36	82843	SPRING.
33	79519	BUSHING.	35, 36	82845	WASHER: (used at both ends).
33	79523	SCREW.	35, 36	82848	HOLDER, brush: (with brush).
33	80294	POST, spring.	34-36	82850	SHIELD, end: (with 80754 oiler).
35, 36	80299	SPRING, end play.	41	82867	RESISTOR: 7,000 ohms.
34	80307	OUTLET: (with 80308 bushing).	41	82870	RESISTOR: 6,300 ohms.
35, 36	80309	WASHER.	29	83408	SCREW.
35, 36	80310	WASHER.	37.4	83799	MOTOR, synchronous.
35, 36	80311	WASHER.	33	83954	BUSHING.
35-37	80312	WASHER.	41	84021	CLAMP, cable.
35, 36	80313	WASHER, split.	36.1, 36.3,	84047	STOP.
38	80334	TERMINAL, contact.	37.		
36.1, 36.3, 38	80335	PLATE, clamping.	33	84360	SHAFT.
38	80336	INSULATOR.	33	84363	COVER.
38	80337	BRACKET.	32, 33	84368	ARM, clutch.
38	80338	BRACKET, adjusting: governor.	33	84369	SLEEVE, friction.
38	80340	PLATE, brush spring.	33	84373	BUSHING.
37, 38	80341	GOVERNOR BRUSH AND SPEED ADJUSTING BRACKET ASSEMBLY.	33	84379	HUB.
			33	84384	SPACER.
36.3, 38	80342	SCREW.	33	84385	STUD, code disk.
34	80351	SCREW.	33	84814	SCREW.
36.1, 36.3, 37, 40.	80352	GOVERNOR ASSEMBLY, center contact.	33	84892	STIFFENER.
37.2, 37.4, 37.5.	80357	SCREW.	30, 33	85559	WASHER.
35, 36, 37.1, 37.2, 37.3.	80358	BEARING, ball: (used at both ends).	32	85935	POST, spring.
38	80444	SCREW.	37.4	86305	STATOR: (with winding).
41	80460	CLAMP, cable.	37.4, 37.5	86308	BOLT.
32	80508	SCREW, segment.	37.4	86311	ROTOR ASSEMBLY: (with cut-out).
35, 36	80558	SHIELD, end: (with 80754 oiler).	37.2, 37.4,	86314	WASHER.
34	80559	STUD, clamping.	37.5.		
33, 37	80706	SCREW.	37.4, 37.5	86320	SCREW.
41	80708	CLAMP, cable.	37.4, 37.5	86321	RING, split.
35, 36, 37.1, 37.3.	80754	OILER: (used at both ends).	37.4, 37.5	86322	BEARING, ball: (used at both ends).
33	80757	SCREW.	37.4	86323	NUT: right-hand; rotor assembly.
33	81560	POST, spring.	37.4, 37.5	86324	NUT: left-hand; rotor assembly.
42	81584	BRACKET.	37.4	86325	CUT-OUT: (with 86326 springs).
33	81724	SPRING, contact: short.	37.4, 37.5	86326	SPRING.
33	81726	TERMINAL.	37.4	86327	INSULATOR.
41	81825	CAPACITOR: 1/100 mf.	35, 36	86329	SCREW.
33.1, 34-36	82283	MOTOR UNIT, synchronous: (new and old style).	37.4	86342	ROTOR ASSEMBLY.
			33	86713	SCREW.
			37.4, 37.5	86746	SCREW.
			40	86848	GROMMET.
				86868	BUSHING.

Figure No.	Reference symbol	Name	Figure No.	Reference symbol	Name
40	86869	POST.	32	92407	BLOCK, terminal.
35, 36	88879	BRUSH HOLDER SUPPORT ASSEMBLY.	32	92408	TERMINAL BLOCK ASSEMBLY.
35, 36	89405	BUSHING.	29	92410	KNOB.
35, 36	89406	BUSHING.	29	92413	KNOB.
35, 36	89407	PIN, cotter.	30	92415	SPRING, friction.
42, 42.1	89925	TERMINAL END.	33	92416	SHAFT.
33	90122	BEARING, ball.	33	92417	BEARING.
34-36	90263	STATOR, wound: (with base).	32	92419	PLATE, stop.
37.4, 37.5	90951	WASHER, lock.	41	92420	PLATE, base.
36.1, 36.3	91617	SHIM.	33	92421	ARM, contact.
29	91683	NUT.	33	92422	BRACKET, contact.
29	91684	NUT: (special).	33	92423	LATCH, contact.
37	91837	WASHER.	33	92427	SPRING, contact: (with buffer).
29	92348	FRAME.	33	92432	LATCH, contact.
29	92349	RING.	30	92437	LAMP.
33	92350	BEARING: rear.	32	92459	CYLINDER, code.
33	92351	BRACKET, bearing.	37.2	92465	WASHER.
31	92352	BASE.	37.2	92467	OILER: (used at both ends).
29, 31	92353	COVER.	37.2, 37.4, 37.5	92468	WASHER: (used at both ends).
30	92354	SEGMENT DISK ASSEMBLY: inner.	37.4, 37.5	92470	WASHER.
30	92356	SEGMENT DISK ASSEMBLY: outer.	30	92813	INSULATOR, brush arm: (with 92930 terminals).
30	92364	SEGMENT, retaining.	29	93075	NUT: (special).
30	92365	PLATE, retaining.	41	93115	SCREW.
32	92366	WORM: 16T (with shaft).	29	93136	SWITCH, toggle.
33	92368	GEAR: 60T (with bushing).	39	93141	SCREW.
32	92369	BAIL, contact.	33	93667	SPRING, contact: (with spacer).
33	92370	LEVER, contact.	41	93706	CABLE, distributor.
32	92371	CYLINDER, code.	41	93707	CABLE, motor.
32	92372	BRACKET, contact.	35, 36	94707	INSULATOR.
32	92373	SHAFT.	29	95282	RESISTOR: 240,000 ohms.
32	92374	SHAFT.	39	95935	BUSHING.
32	92375	GEAR SEGMENT.	39	95936	COIL, retardation.
33	92376	SPACER.	39	95937	CAPACITOR: 1/100 mf.
32	92377	BEARING, oil disk.	39	95938	CAPACITOR: 1/10 mf.
32	92378	HOLDER, oil wick.	31	96458	HOOD.
32	92379	OIL WICK.	32	96459	CYLINDER, code.
32	92380	PINION: 12T (with shaft).	29	96460	PLATE, panel: right.
32	92382	SCREW, shoulder.	41	96461	BRACKET.
32	92383	GEAR, idler.	29	96462	INSULATOR.
29	92384	PANEL: left.	33	96463	PULLEY, brake.
29	92385	PANEL: right.	33	96464	WEDGE, brake.
30	92387	INSULATOR.	33	96465	POST.
30	92391	PLATE, clamp.	33.2, 36	96473	GEAR SET: for 368 opm.
30	92392	ARM, brush.	33.2	96474	GEAR SET: for 460 opm.
30	92393	BLOCK, clamp: brush arm.	36.2, 36.4	96572	GEAR SET: 368 opm.
30	92395	CLAMP, lamp.	36.2, 36.4	96573	GEAR SET: 460 opm.
30	92396	LAMP ARM ASSEMBLY.	29	96774	NAMEPLATE: patent.
29	92397	SCALE, signal measuring.	41, 42	96814	RESISTOR UNIT ASSEMBLY: 150-300-600 ohms.
33	92398	GEAR, worm: 40T.			
29	92399	PLATE, panel: left.	42.1	97569	BRACKET.
29	92400	PLATE, panel: right.	41, 42.1	97571	RESISTOR UNIT ASSEMBLY: 250-500-1,000 ohms.
29	92401	DISK, cover.			
30	92402	HUB.	37, 39	99250	MOTOR GOVERNOR FILTER ASSEMBLY.
33	92406	SHAFT: (with gear).			

Figure No.	Reference symbol	Name	Figure No.	Reference symbol	Name
39	99354	CONTAINER.	36.1, 36.3	107095	GOVERNOR BRUSH AND ADJUSTING BRACKET ASSEMBLY.
39	99355	BRACKET.			
39	99356	BRACKET.			
39	99357	CLIP.	37.1	107151	MOTOR, series.
31	99762	PLUG: 2-prong.	29	107170	SCREW.
31	99763	CORD ASSEMBLY.	37.2	107443	CORE, field.
31	99819	CORD: (with two 82474 terminals).	37.2	107444	COIL, field: upper; (with clip).
			37.2	107445	COIL, field: lower; (with clip).
37.5	101398	CUT-OUT: (with 101399 springs).	37.2	107446	PIN, retaining: coil.
37.5	101399	SPRING.	37.2	107447	SHIELD, end: (with 92467 oiler).
29	101489	SPRING.	37.2	107448	BUSHING.
29	101490	STUD.	37.2	107449	SHIELD, end: (with 92467 oiler).
29	101491	LEVER, brake.	37.2	107450	BOLT.
37.2	101589	WASHER, clamping.	37.1, 37.2, 37.3.	107451	HOLDER, brush: (with clip).
41	102164	NAMEPLATE.			
33.2, 36	102662	PINION: 9T, for 368 opm; (with hub).	37.2	107452	BRUSH: (with spring).
			37.2	107453	SCREW, brush holder.
33.2, 36	102663	GEAR: 44T, for 368 opm; (with hub).	37.2	107454	SCREW.
			37.2	107455	ARMATURE.
36.2, 36.4	102665	GEAR: 32T, for 460 opm; (with hub).	37.2	107456	ARMATURE ASSEMBLY: (with ball bearings).
36.2, 36.4	102666	PINION: 7T, for 460 opm; (with hub).	37.1, 37.3	110306	PLATE LOCK.
			37.1	110307	ARMATURE ASSEMBLY: (with 80358 oiler).
36.2, 36.4	102667	PINION: 7T, for 368 opm; (with hub).			
			37.1, 37.3	110308	BOLT.
33, 36.2, 36.4.	102668	GEAR: 40T, for 368 opm; (with hub).	37.1, 37.3	110310	BRUSH: (with spring).
			37.1, 37.3	110312	SPRING, washer.
33.2	102669	PINION: 12T, for 460 opm; (with hub).	37.1, 37.3	110314	WASHER.
			37.1, 37.3	110316	SCREW, brush holder.
33.2	102670	GEAR: 47T, for 460 opm; (with hub).	37.1, 37.3	110323	RETAINER.
			37.1, 37.3	110324	WASHER.
34, 35, 36	102774	BOLT.	37.1, 37.3	110325	RETAINER.
37.2	102836	RING, retaining.	37.1, 37.3	110326	SCREW, set.
37.2	102837	WASHER.	37.1, 37.3	110327	BUSHING.
29	103178	BRAKE LEVER ASSEMBLY.	33.2	110889	PINION: 12T, for 600 opm; (with hub).
31	103230	LINE CORD ASSEMBLY: 2-conductor; (red plug).			
			33.2	110890	GEAR: 37T, for 600 opm; (with hub).
31	103231	LINE CORD ASSEMBLY: 2-conductor; (black plug).			
			33.2	110897	GEAR SET: for 600 opm.
31	103232	LINE CORD ASSEMBLY: single-conductor; (red plug).	36.2, 36.4	110898	PINION: 10T, for 600 opm; (with hub).
31	103233	LINE CORD ASSEMBLY: single-conductor; (black plug).	36.2, 36.4	110899	GEAR: 35T, for 600 opm; (with hub).
31	103234	CORD: (with terminals).		111605	SCREW.
31	103235	CORD: (with terminals).	36.2, 36.4	113210	GEAR SET: for 600 opm.
31	103236	PLUG: (black shell).	37.5	113888	STATOR: (with winding).
34, 35, 36	103431	GROMMET.	37.5	113889	ROTOR ASSEMBLY: (with cut-out).
29	103539	SCREW.			
37.2	104038	MOTOR, series.	37.5	113890	ROTOR ASSEMBLY: (with bearings and split ring).
37.5	104061	MOTOR, synchronous.			
36.1, 36.3	104451	WASHER, lock.	37.1, 37.3	113941	SHIELD, end: (with 80754 oiler).
36.1	105394	CABLE.	37.1, 37.3	113942	SHIELD, end: (with 80754 oiler).
36.3	105748	CABLE.	37.3	113943	ARMATURE ASSEMBLY: (with 90358 ball bearings).
37.4, 37.5	105918	SPACER.			
37.3	106875	MOTOR, series.	37.4, 37.5	113944	SHIELD, end: (with 70771 oiler).
36.1	107094	GOVERNOR FILTER ASSEMBLY, motor.	37.4, 37.5	113945	SHIELD, end: (with 70771 oiler).

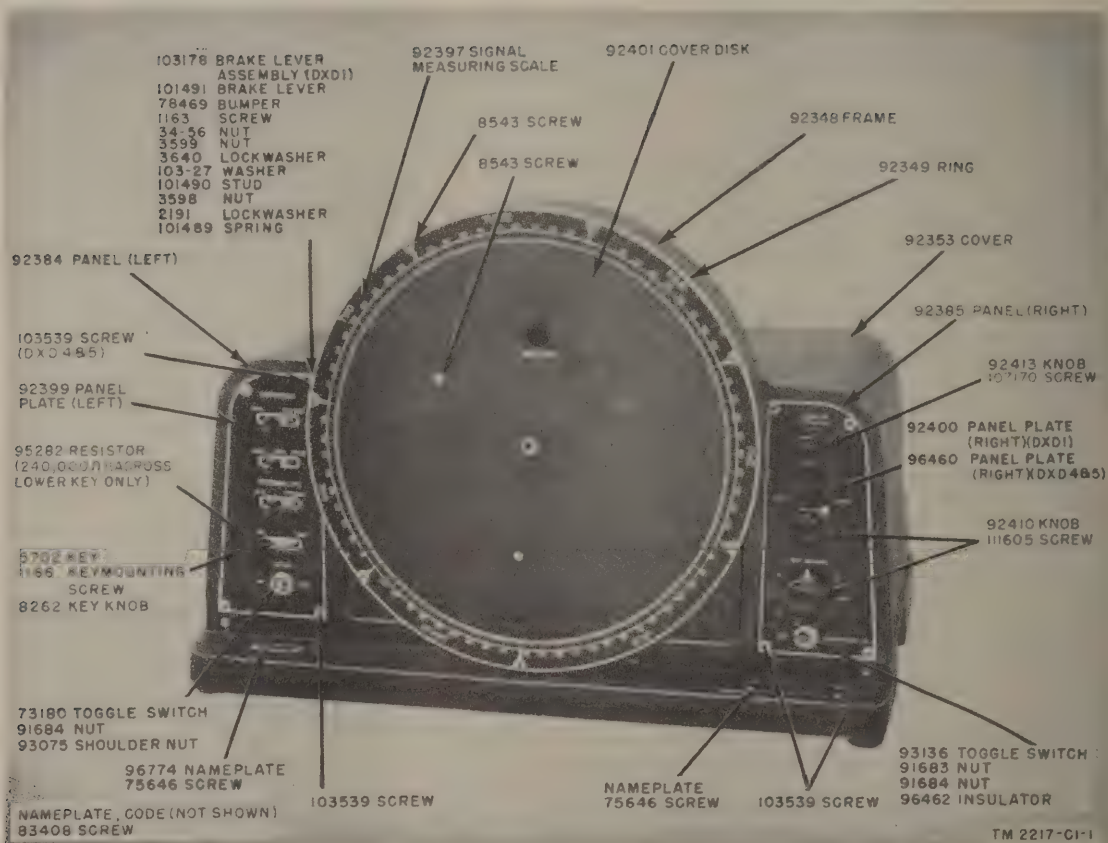


Figure 29. (Superseded.) Distortion Test Set TS-383(*)/GG, front view, hood removed, location of parts for DXD1, DXD4, and DXD5.

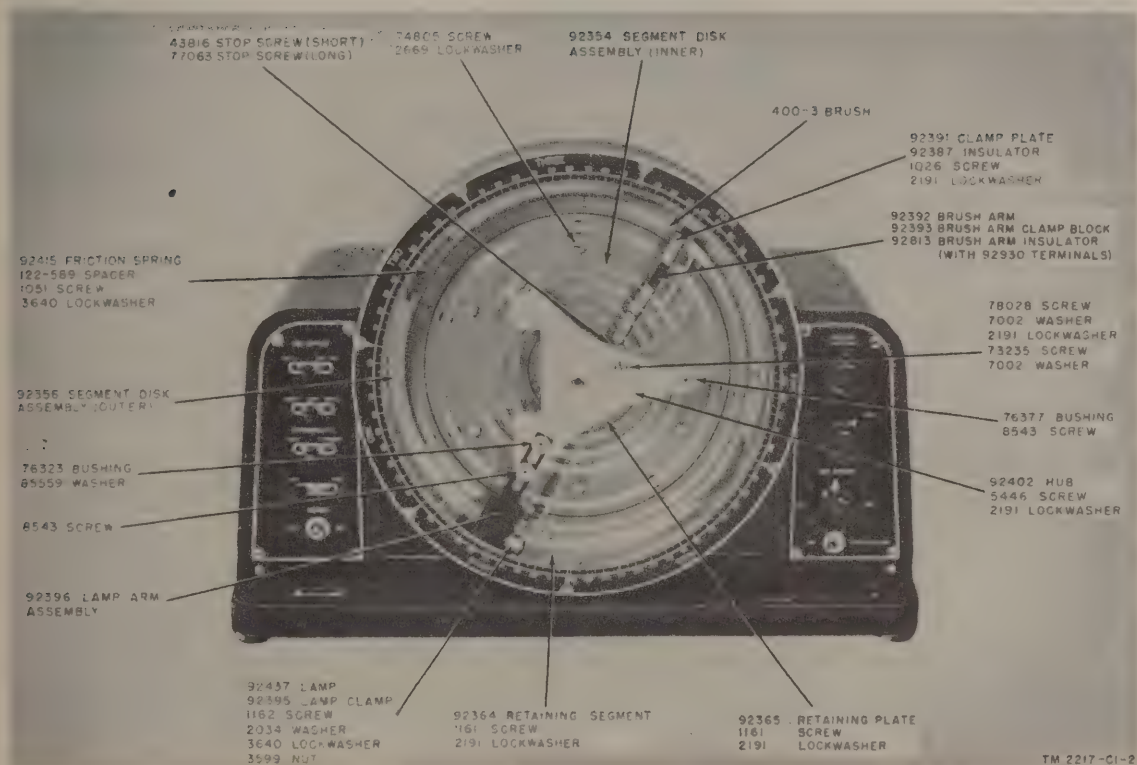


Figure 30. (Superseded.) Distortion Test Set TS-383(*)/QG, front view, face plate removed, location of parts for DXD1, DXD4, and DXD5.

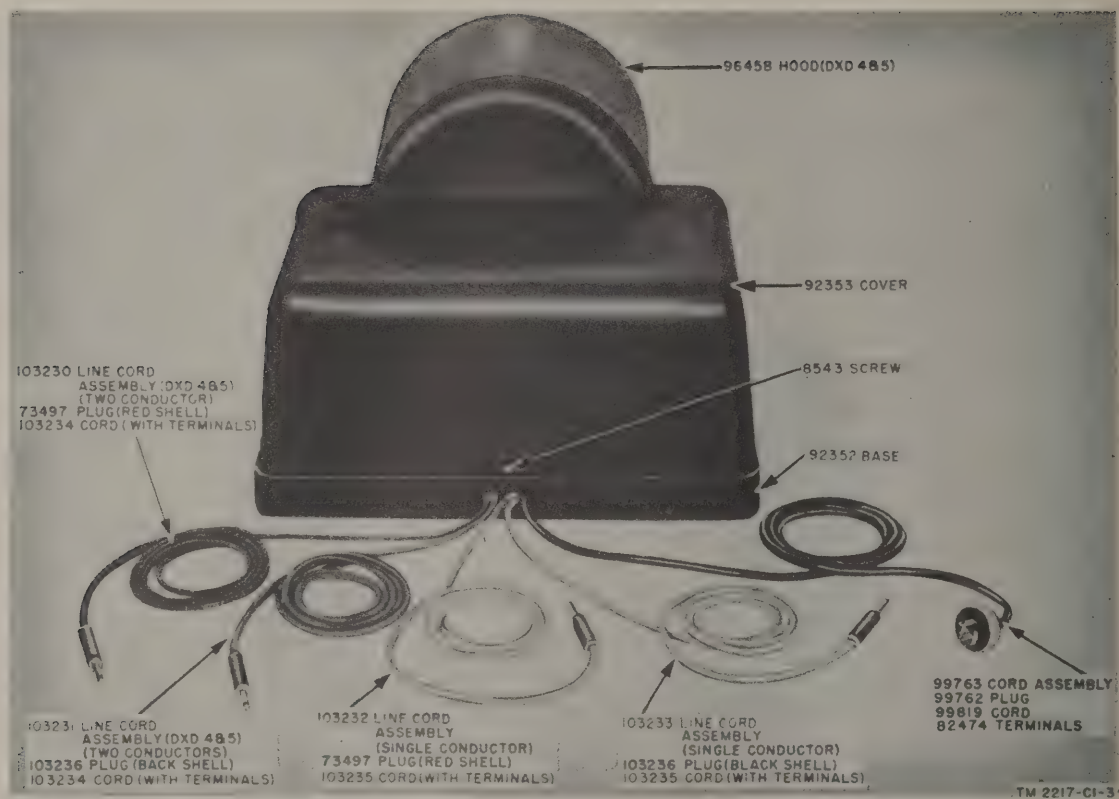


Figure 31. (Superseded.) Distortion Test Set TS-383(*)/GG, rear view, location of parts for DXD1, DXD4, and DXD5.

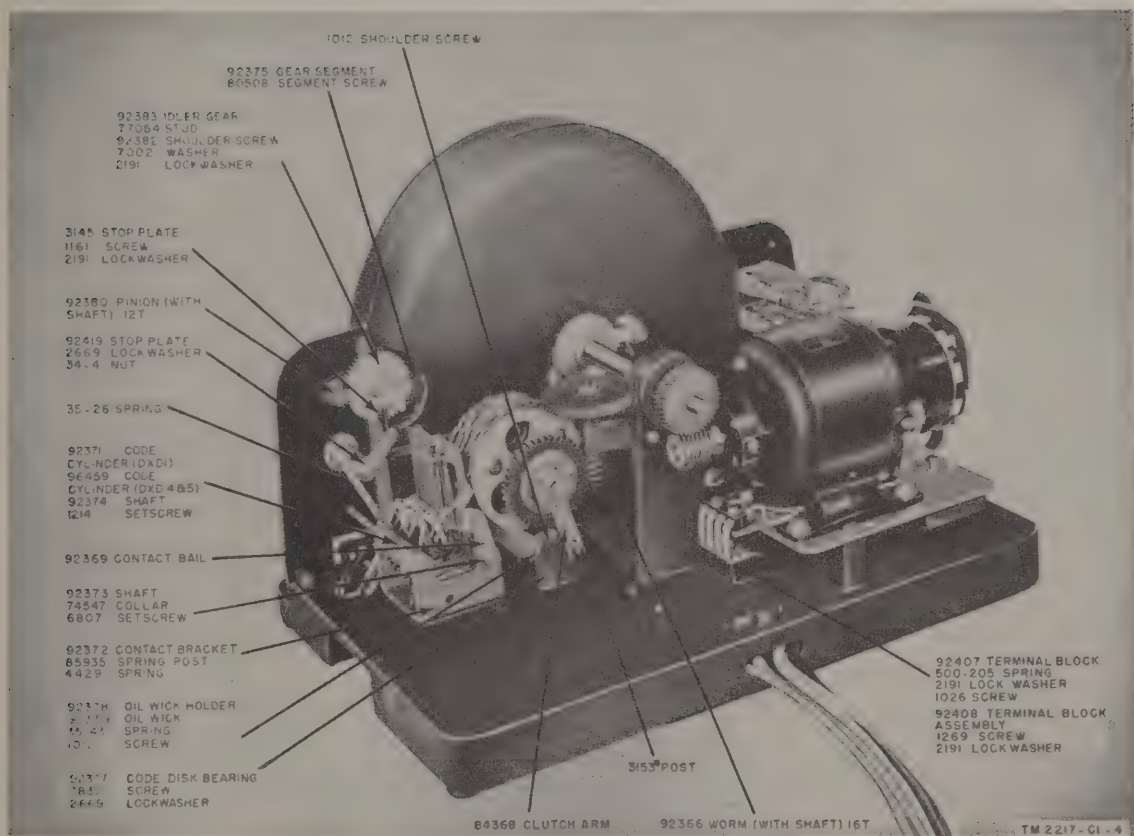


Figure 32. (Superseded.) Distortion Test Set TS-383(*)/CG, left rear view, location of parts for DXD1, DXD4, and DXD5.

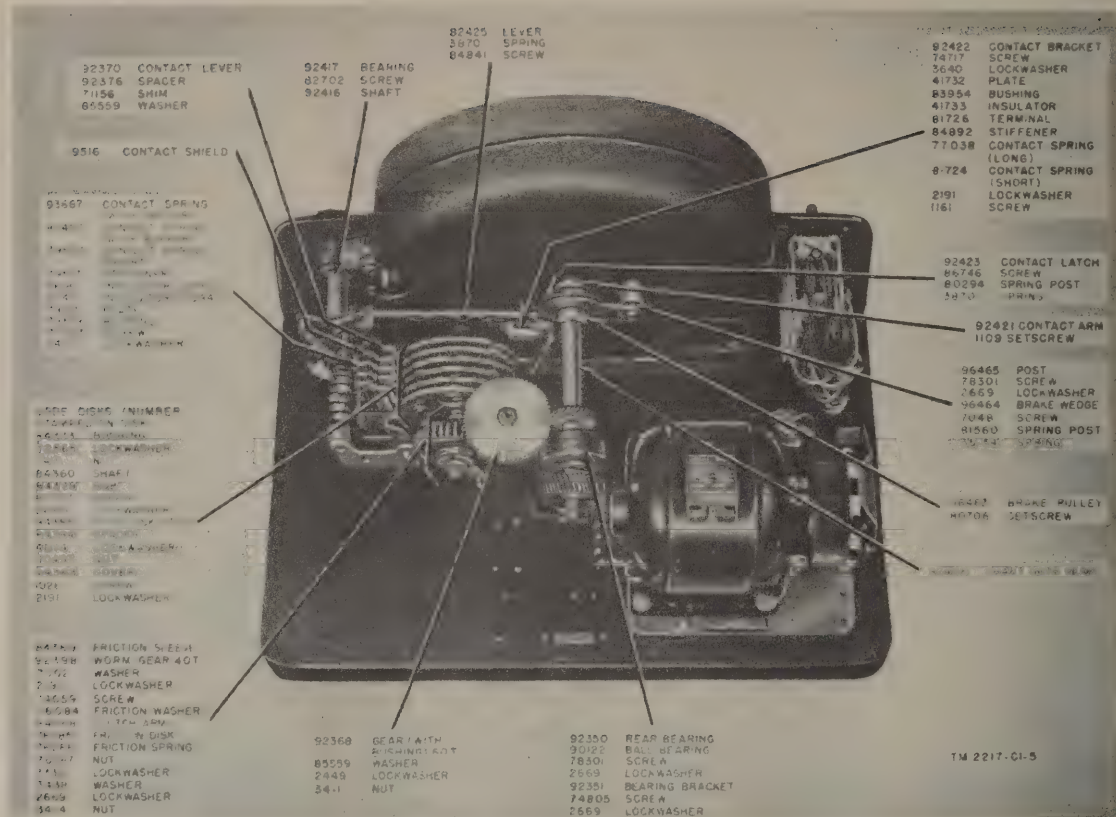


Figure 33. (Superseded.) Distortion Test Set TS-383(*)/GG, top rear view, location of parts for DXD1, DXD4, and DXD5

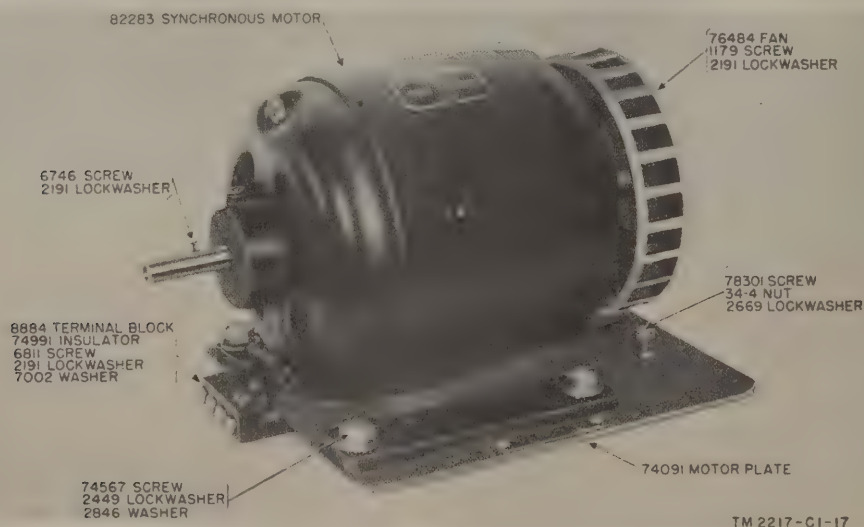


Figure 33.1. (Added.) Synchronous motor unit MU4, location of parts.

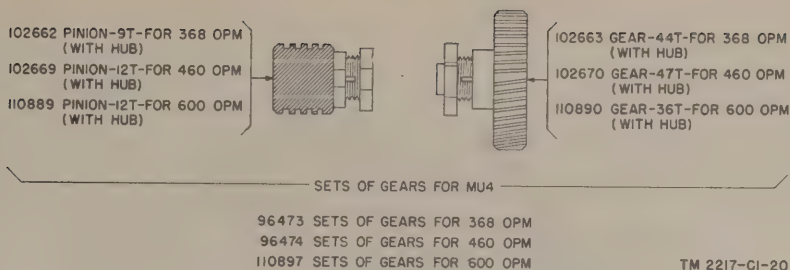


Figure 33.2. (Added.) Sets of gears for MU4.

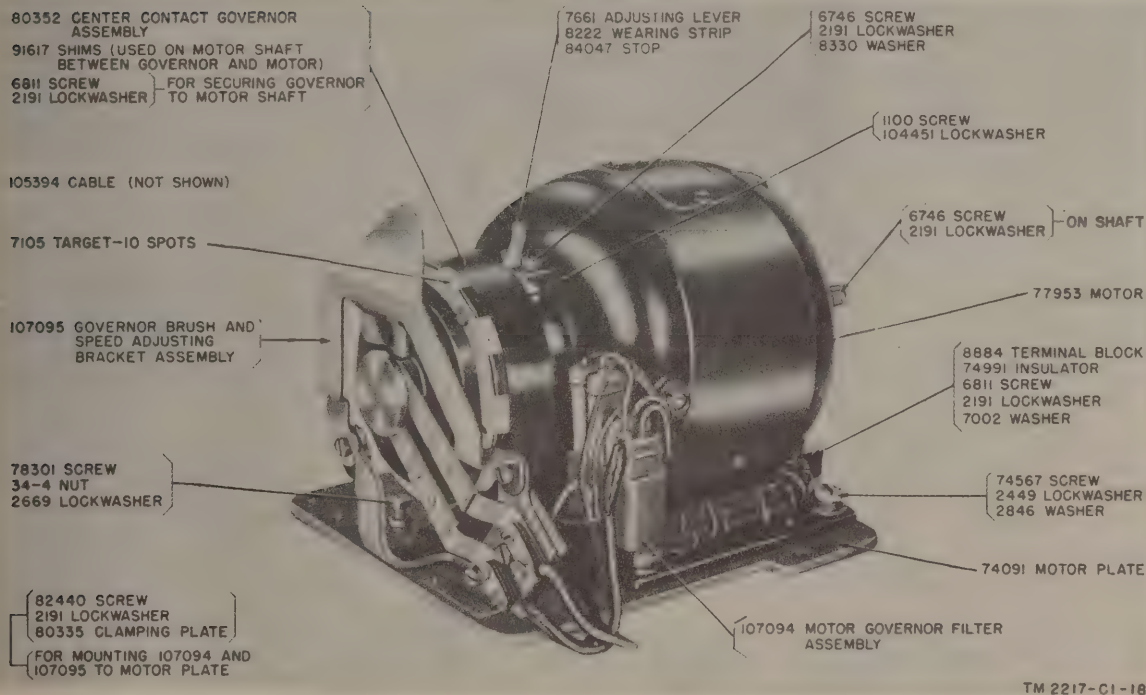


Figure 36.1. (Added.) Governed motor unit MU26, location of parts.

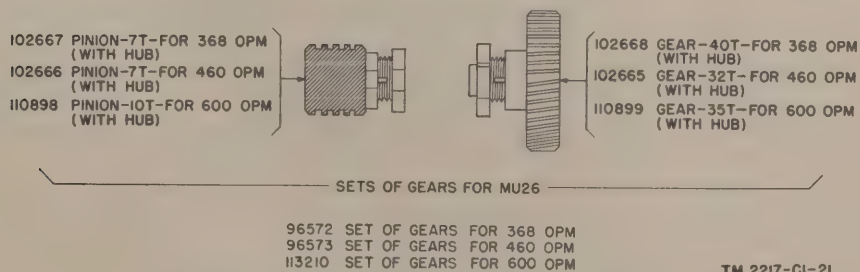


Figure 36.2. (Added.) Sets of gears for MU26.

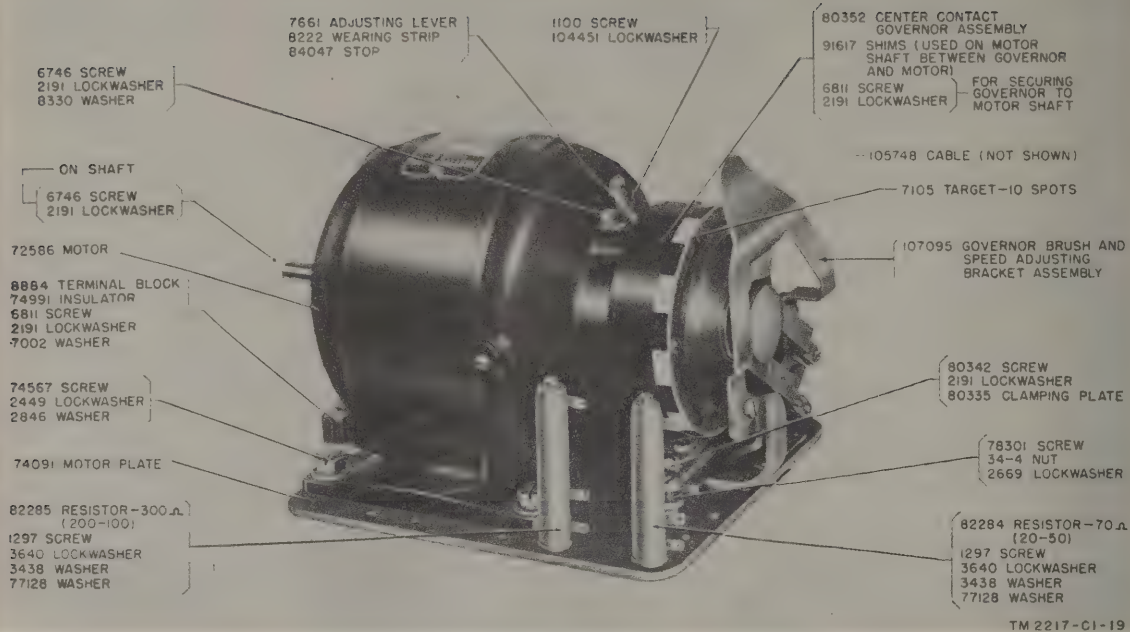


Figure 36.3. (Added.) Governed motor unit MU29, location of parts.

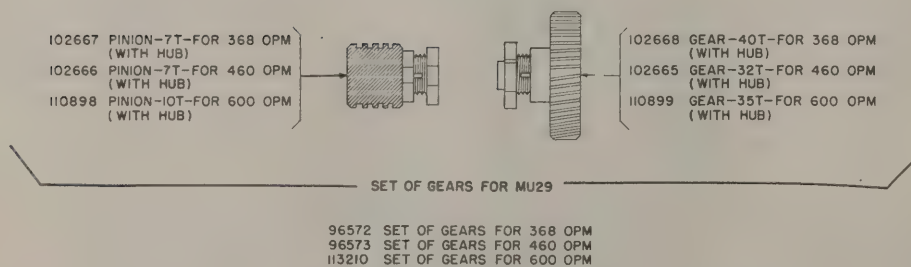
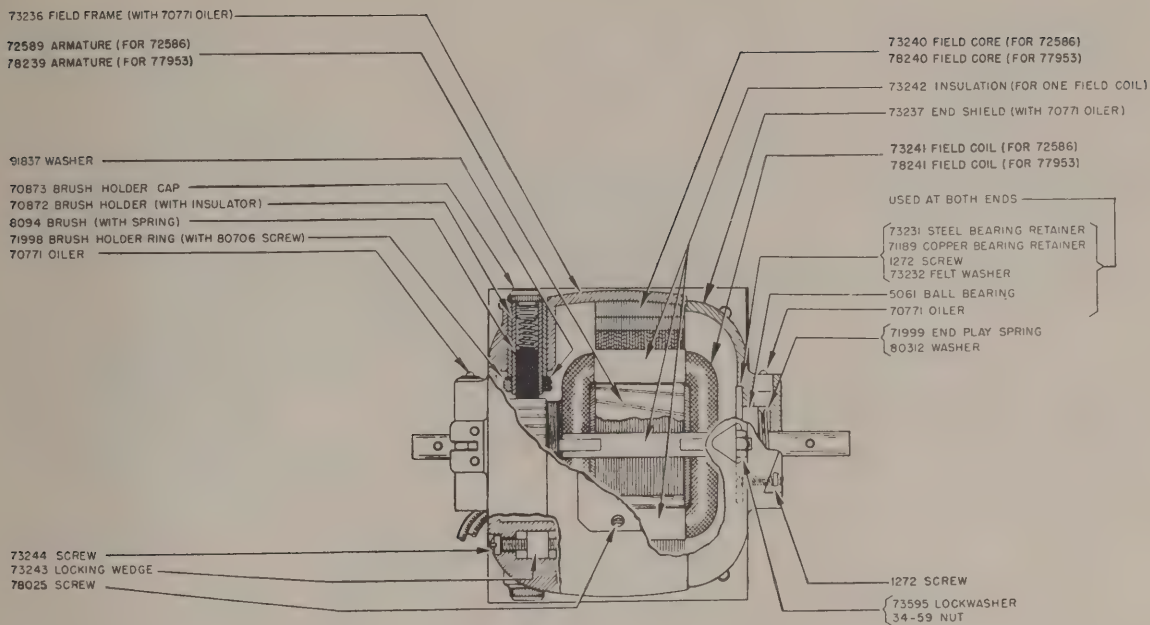


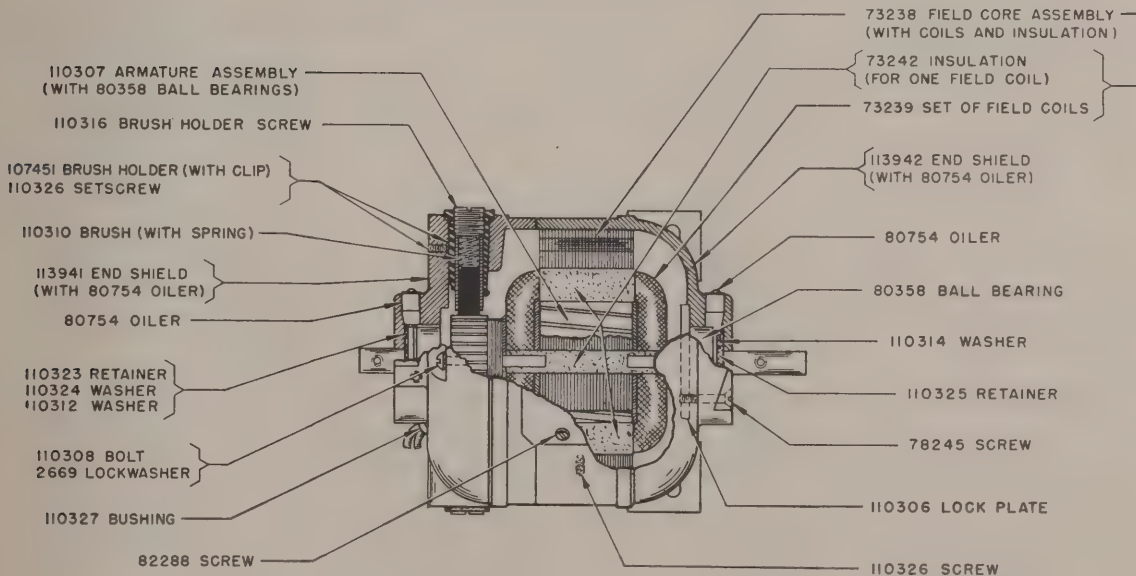
Figure 36.4. (Added.) Sets of gears for MU29.



72586 GOVERNED MOTOR (PART OF MU29)
77953 GOVERNED MOTOR (PART OF MU26)

TM 2217-CI-9

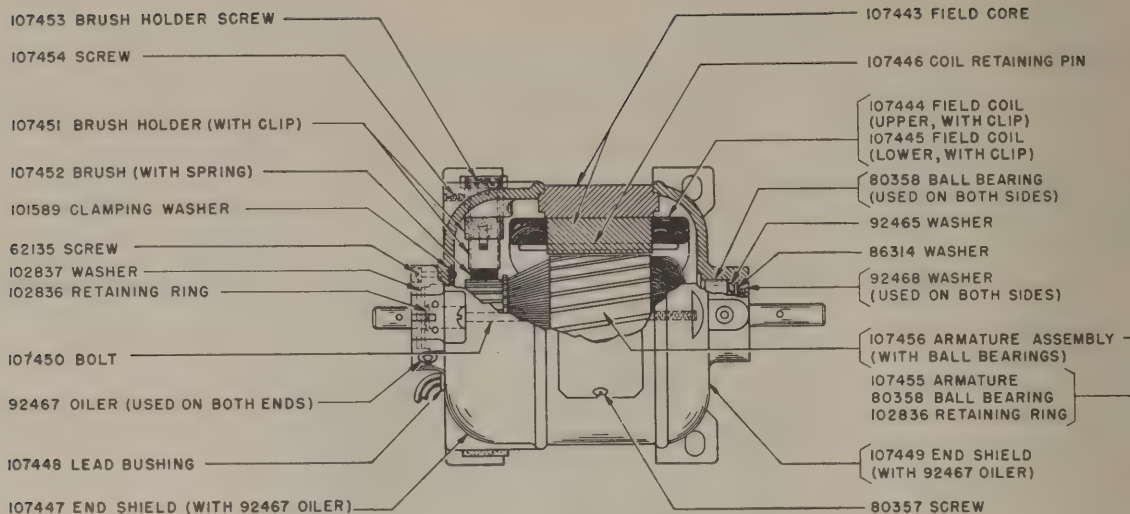
Figure 37. (Superseded.) Governed motor unit, location of parts.



107151 SERIES MOTOR
(MAY BE FURNISHED AS SUBSTITUTE FOR 6708)

TM 2217-CI-10

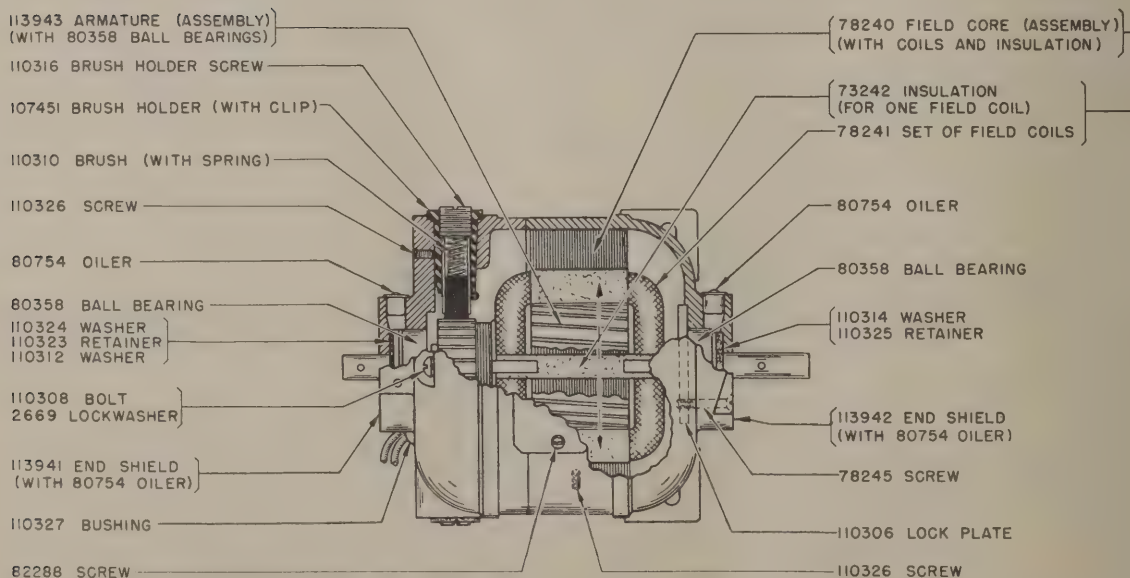
Figure 37.1. (Added.) Series motor (substitute for 6708), location of parts.



IO4038 SERIES MOTOR
(MAY BE FURNISHED AS SUBSTITUTE FOR 77953)

TM 2217-CI-11

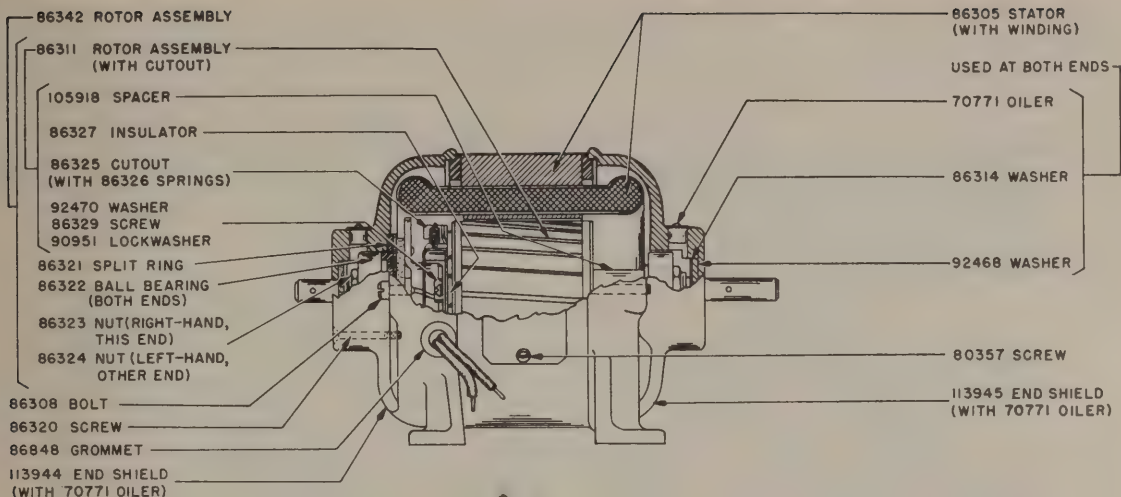
Figure 37.2. (Added.) Series motor (substitute for 77953), location of parts.



IO6875 SERIES MOTOR
(MAY BE FURNISHED AS SUBSTITUTE FOR 77953)

TM 2217-CI-12

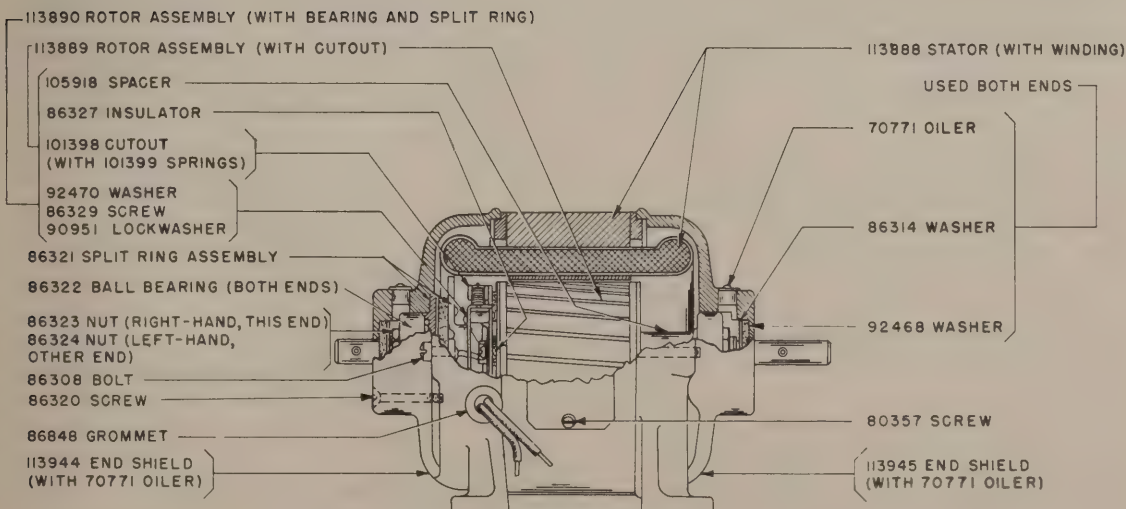
Figure 37.3. (Added.) Series motor (substitute for 77953), location of parts.



83799 SYNCHRONOUS MOTOR
(MAY BE FURNISHED AS SUBSTITUTE FOR 82283)

TM 2217-CI-13

Figure 37.4. (Added.) Synchronous motor (substitute for 82283), location of parts.



104061 SYNCHRONOUS MOTOR
(MAY BE FURNISHED AS SUBSTITUTE FOR 82714)

TM 2217-CI-14

Figure 37.5. (Added.) Synchronous motor (substitute for 82714), location of parts.

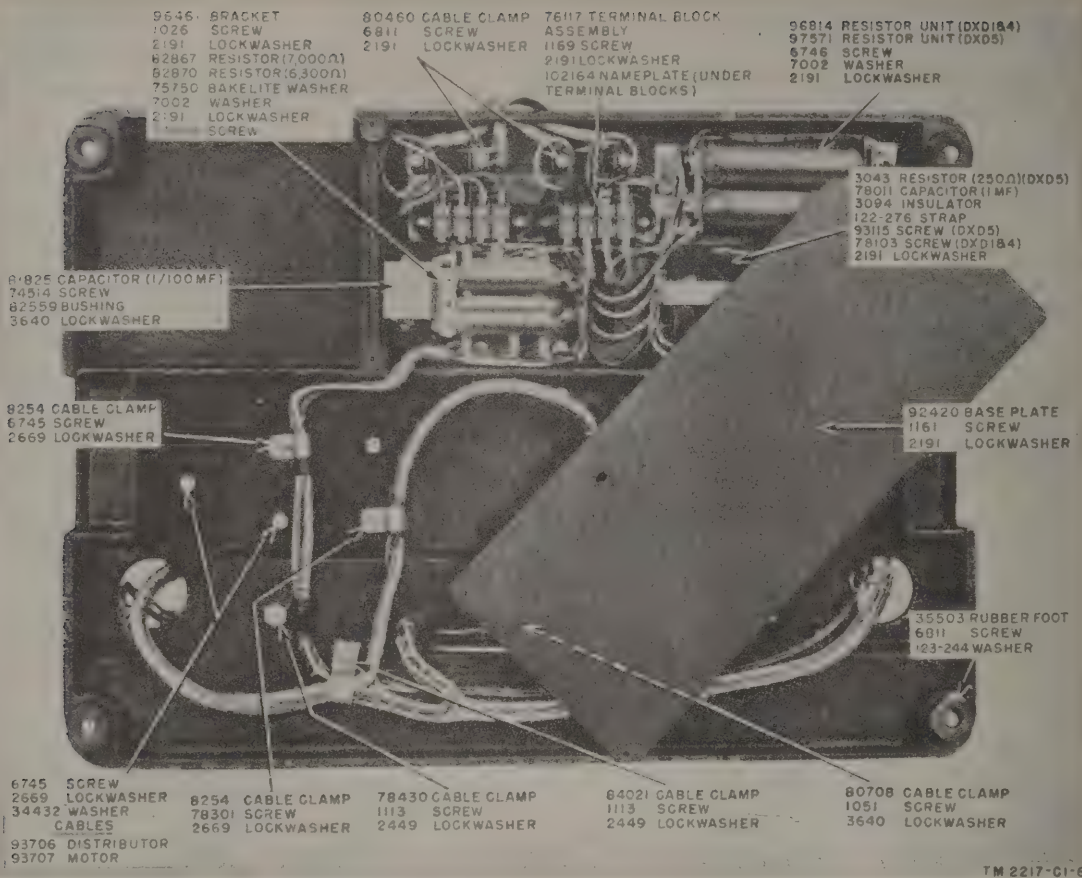


Figure 41. (Superseded.) Distortion Test Set TS-383(*)/GG, bottom view, location of parts for DXD1, DXD4, and DXD5

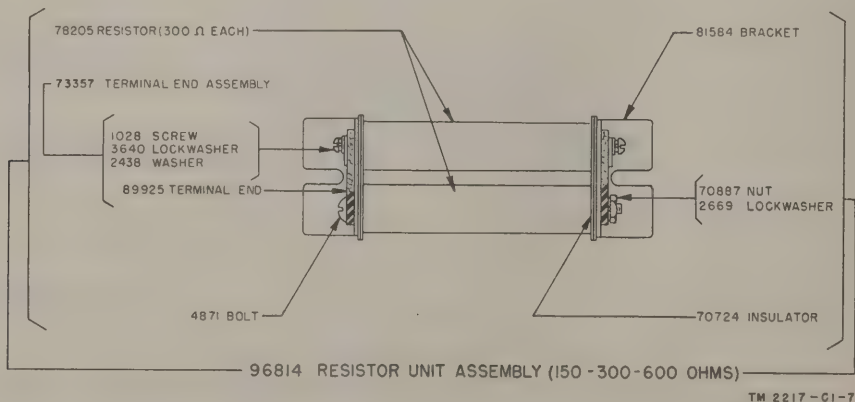


Figure 42. (Superseded.) Resistor unit assembly for DXD1 and DXD4, location of parts.

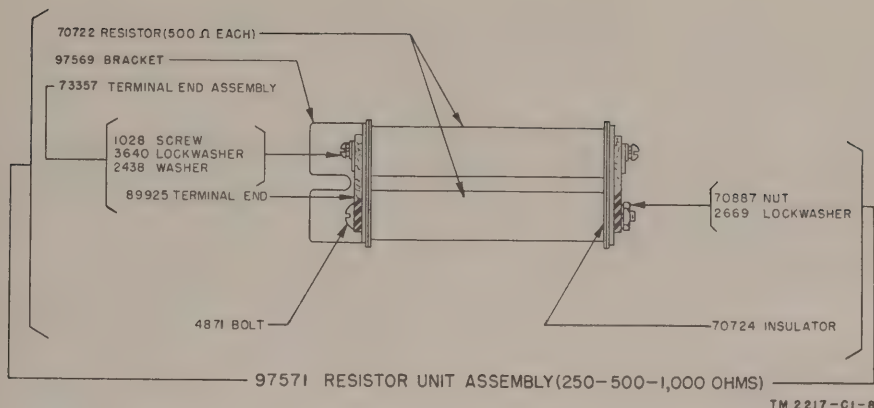


Figure 42.1. (Added.) Resistor unit assembly for DXD5, location of parts.

On figure 43, change the value of the resistor across the contact springs of the LINE-DIST key from 250,000 Ω to 240,000 Ω .

Figure 43. Distortion Test Set TS-383(★)/GG, wiring diagram.

On figure 44, change the value of the resistor across the contact springs of the LLNE-DIST key from 250,000 Ω to 240,000 Ω .

Figure 44. Distortion Test Set TS-383(★)/GG, wiring diagram (revised).

[AG 300.7 (8 Sep 48)]

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Major General
The Adjutant General

OMAR N. BRADLEY

Chief of Staff, United States Army

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WAR DEPARTMENT TECHNICAL MANUAL
TM 11-2217

This manual supersedes TM 11-2217, 14 March 1945.

DISTORTION
TEST SET
TS-383/GG



WAR DEPARTMENT

OCTOBER 1946

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WAR DEPARTMENT

Washington 25, D. C., 16 October 1946

TM 11-2217, Distortion Test Set TS-383/GG, is published for the information and guidance of all concerned.

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For explanation of distribution formula, see FM-21-6

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DESTRUCTION NOTICE

WHY —To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW —1. Smash—use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.
2. Cut—Use axes, handaxes, machetes.
3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.
4. Explosives—Use firearms, grenades, TNT.
5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT

WHAT—1. Smash—Base, covers, hood, control panels, motor, distributor disk, code disk transmitter, shafts, gears.
2. Cut—All power and signal cords, wiring.
3. Burn—Technical Manuals, records.
4. Bury or scatter—Any or all of the above parts after they have been destroyed.

DESTROY EVERYTHING

SAFETY NOTICE

Severe shock may result from contact with current-carrying parts of this equipment. Always be sure the power is disconnected before making adjustments or repairs.



Figure 1 . Distortion Test Set TS-383/GG in use with teletypewriter equipment.

PART ONE

INTRODUCTION

Section 1. DESCRIPTION OF DISTORTION TEST SET TS-383/GG

1. General

a. Distortion Test Set TS-383/GG is a portable, motor-driven teletypewriter signal distortion test set. Prior to the assignment of official nomenclature this test set was referred to in other technical manuals by the manufacturer's designation, distortion test set DXD1 or DXD4.

b. The test set is designed to transmit either perfect or biased five-unit start-stop teletypewriter

signals for testing and calibrating purposes. It is equipped with a neon stroboscope indicating lamp. The test set shows accurately the length of the seven impulses making up the five-unit start-stop signals received from a teletypewriter circuit or equipment under test. Distortion produced in the transmitted signals may be either marking or spacing bias or marking or spacing end distortion. Transmitted signals are a continuous repetition of one of the following 10 choices: a standard test message, R, Y, T, O, M, V, LET (letters), BLK (blank, or code length marking impulses. The se-

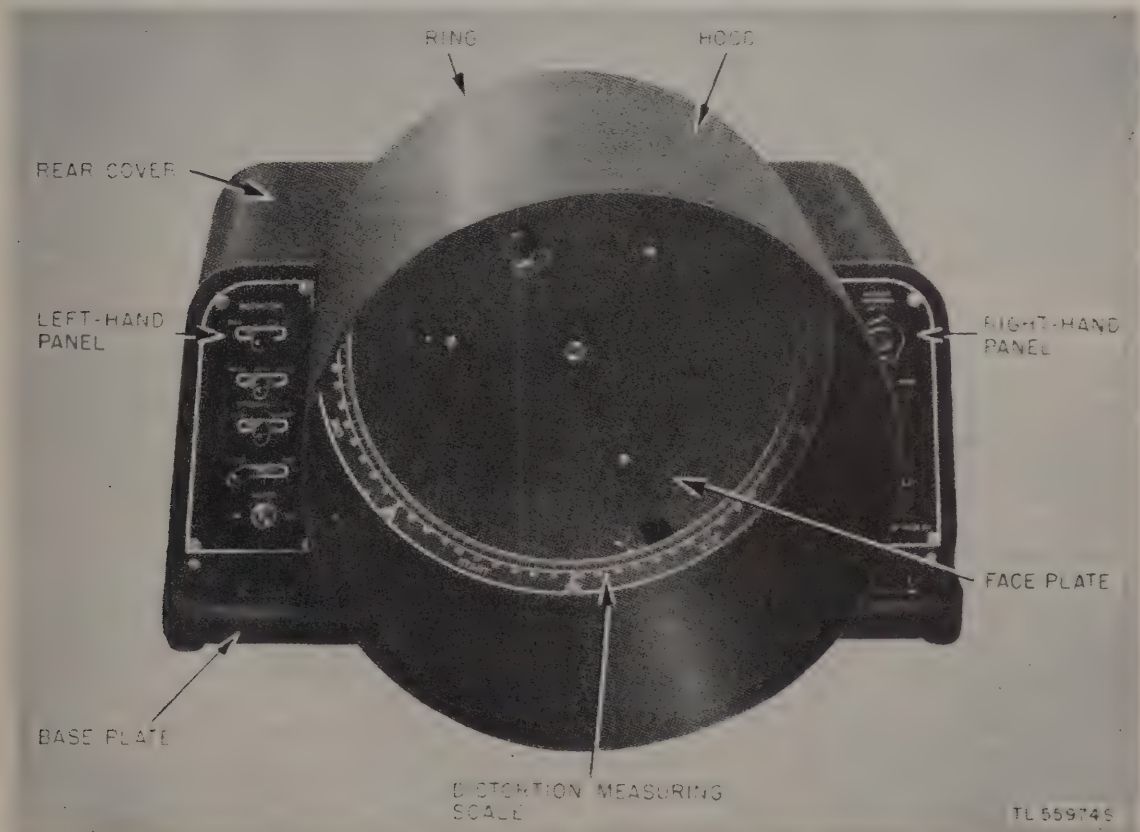


Figure 2. Distortion Test Set TS-383/GG, front view with hood.

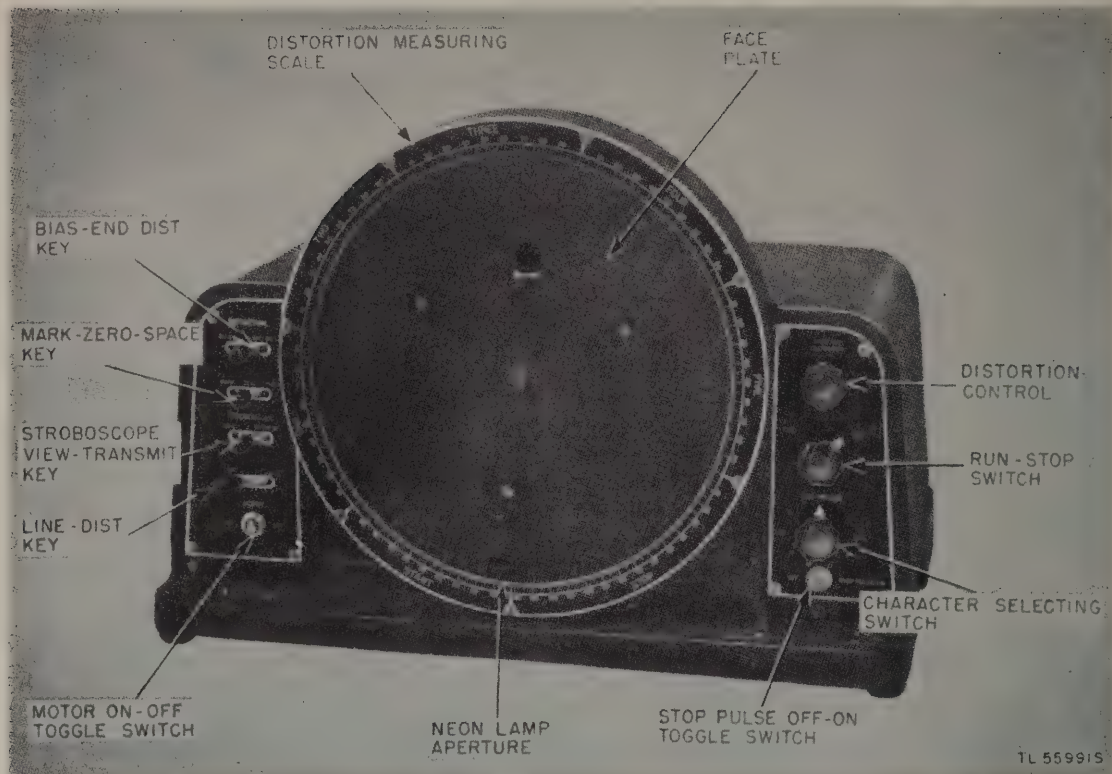


Figure 3. Distortion Test Set TS-383/GG, front view, hood removed.

lected test signal can have a controlled amount of distortion from zero to approximately 100 per cent.

c. The test set may be equipped with a 110- to 115-volt, 60-cycle alternating current (ac) synchronous motor unit, which includes gears for 368.1 operations per minute (opm), or a 110- to 115-volt, 60-cycle a-c governed motor unit. A governed motor requires greater care than a synchronous motor for accurate results. A governed motor must be used, however, when testing British (Creed) equipment. A synchronous motor should be used when testing other test equipment.

d. To get accurate stroboscope readings, the test set and the equipment being tested must be connected to the same source of power. The 110- to 115-volt direct current (dc) required for the operation of the stroboscope and the signal line must be supplied from an outside source, normally the equipment being tested.

2. Table of Components

The items listed in table I are the components of

Test Set TS-383/GG. Weight, dimensions, and volume are for the equipment unpacked and ready for use.

Table I

Quantity	Component	Weight (pound)	Dimensions (inches)	Volume (cubic feet)
1	96458 hood. (See fig. 31.)	2	8x12 diam	0.51
1	77953 governed motor or 82283 synchronous motor. (See figs. 32 and 34 through 37.)	12	6x9x5.5	0.23
1	92353 cover. (See figs. 29 and 31.)	5	11x19x7	0.8
1	92352 base with 92348 frame. (See figs. 29 and 31.)	100	14x19x13.5	2.07
1	99891 motor power cord. (See fig. 31.)		66 lg	
2	103234 cord. (See fig. 31.)		66 lg	
2	103235 cord. (See fig. 31.)		66 lg	

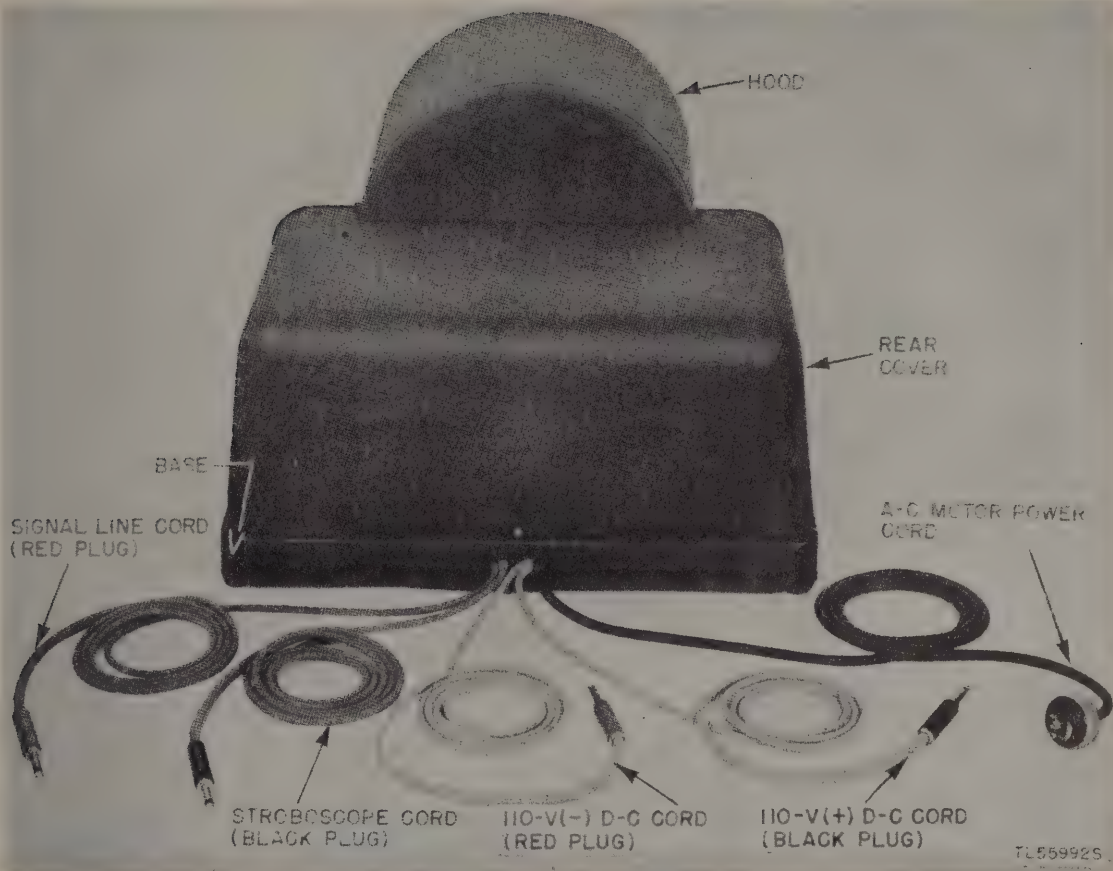


Figure 4. Distortion Test Set TS-383/GG, rear view.

3. Packaging

a. For domestic shipment, Distortion Test Set TS-383/GG is packed in corrugated or solid fiber board boxes. The box flaps are sealed by taping, stitching, or with a suitable adhesive, or by a combination of these methods. Packaged for domestic shipment, the test set weighs about 155 pounds.

b. For oversea shipment, Distortion Test Set TS-383/GG is packed in a cleated, wooden packing case reinforced with steel straps and fitted with a sealed waterproof liner bag. (See fig. 5.) Crated for oversea shipment, the test set weighs approximately 225 pounds and displaces $10\frac{1}{2}$ to $12\frac{1}{2}$ cubic feet.

Note. Some variation from the weight and displacement figures must be expected because of differences in shipping containers.

4. Physical Description

a. Distortion Test Set TS-383/GG is a self-contained unit 19 inches long, $13\frac{1}{2}$ inches high, and 14 inches deep. It weighs 125 pounds. The test set is mounted on a single base, on the under part of which are the terminal blocks and filters. All of the controls are available on the front panels of the test set.

b. A large circular panel is mounted on the front of the test set. The circumference of this panel is scaled off in seven divisions, comparable to the five-unit start-stop teletypewriter code. A removable face plate covers the distributor face which is equipped with six concentric rings. The two outer rings, one movable and the other stationary, are segmented rings, and the four inner rings are solid conductors. A hub, which revolves around a main shaft, mounts the distributor brush arm and the lamp arm. Six brushes, one for each

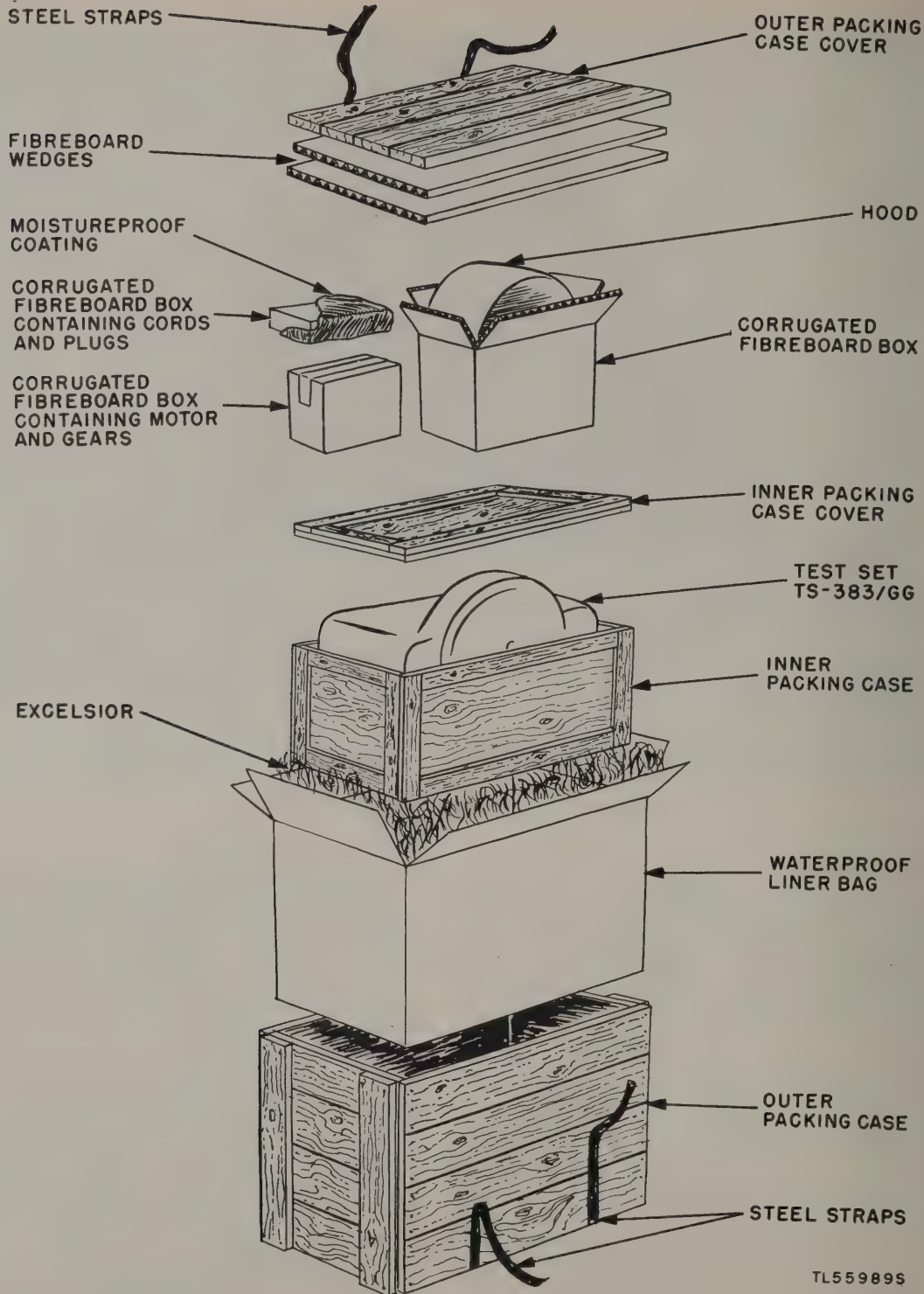


Figure 5. Distortion Test Set TS-383/GG packaged for overseas shipment.

distributor ring, are mounted on the brush arm. A small neon lamp, which provides a visual stroboscope measurement of the various functions of the test set, is mounted on an arm opposite the brush arm.

c. A metal cover, housing the interior of the test set, is held in place by three screws. Access to the interior of the test set may be had by removing these screws, one in the rear of the cover and one on either side. Removing the cover exposes the motor unit, code disk transmitter, and gear assemblies.

d. At the rear of the test set are five cords for making the various connections to the test set. A rubber-covered cord with a convenience plug is provided for connection to an a-c power source. Two slate-colored cords with black and red plugs are provided for connection to -110 and +110 volts dc. Two green cords with black and red plugs are provided for incoming and outgoing signals.

e. A cylindrical metal hood, which slips over the circular front panel, provides a light shield to facilitate easier and more accurate reading of the stroboscope indicating light.

f. The exterior portions and the base of the test set are finished with a black wrinkle-finish paint.

5. Differences in Models

a. STOP PULSE TOGGLE SWITCH. Late DXD1 models and all DXD4 models of Distortion Test Set TS-383/GG have a toggle switch on the right-hand control panel for disconnecting the stop pulse. This permits transmitting a single marking impulse of code length with the code selecting switch set to T. Early models of the test set are not equipped with this toggle switch.

b. 115-V D-C CORDS. All DXD1 models of Distortion Test Set TS-383/GG have one cord for providing d-c power for the stroboscope. DXD4 models are equipped with two single-conductor cords, one with a red plug for negative 115-volt dc and one with a black plug for positive 115-volt dc.

c. MAIN SHAFT. (1) On the main shaft, the gear used in early DXD1 models of Distortion Test Set TS-383/GG has been replaced in late DXD1 and DXD4 models with a 44T gear if the unit is equipped with a synchronous motor or a 40T gear if the unit is equipped with a governed motor. The hub used with either of these gears is tapered, and tightens onto the shaft as it is screwed into the gear.

(2) A reverse rotation stop, mounted on the

main shaft at the rear of the frame, has been added in late DXD1 and in DXD4 models of Distortion Test Set TS-383/GG. This stop prevents a counterclockwise rotation of the brush arm.

d. OUTER RING BRAKE. Late DXD1 models of Distortion Test Set TS-383/GG have a brake which bears against the outer ring on its upper left-hand corner. This brake prevents rotation of the ring after it has been set in a desired position.

e. RESISTOR. A 250,000-ohm resistor has been added across the contact springs of the LINE-DIST key on late DXD1 models and on DXD4 models.

f. HOOD. A cylindrical hood is supplied with DXD4 models of the distortion test set to improve the visibility of the signals. The hood fits over the movable ring behind the distortion measuring scale.

g. BRAKE. A brake has been added to late DDX1 models of Distortion Test Set TS-383/GG to prevent rotation of the distortion control after it has been set in a desired position.

Section II. APPLICATION OF DISTORTION TEST SET TS-383/GG

6. Application

a. PRINCIPAL USES. The principal uses of Distortion Test Set TS-383/GG are:

(1) Checking the efficiency of the selecting mechanisms in teletypewriters and reperforators.

(2) Checking the operation of relays used in terminal, switching, or repeater equipment.

(3) Measuring the length of each of the seven impulses transmitted by a teletypewriter, transmitter distributor, or reperforator to determine the amount (percent) of distortion in the signals.

(4) Measuring the amount (percent) of distortion in the signals received from a distant teletypewriter or transmitter connected either by wire or radio circuits.

(5) Calibration of bias meters in Switchboard BD-100 and Line Unit BE-77-().

b. USE WITH ALLIED EQUIPMENT. Distortion Test Set TS-383/GG is designed and built to conform with the normal American speed of 368.1 opm with a 7.42-unit code length. The British code length is 7.50, operating at a speed of 400 opm. When operating American teletypewriters with British equipment the American equipment must transmit its 7.42-unit code lengths at an increased speed of 404 opm. The same precautions as to

length of typed lines and various operational features that pertain to interoperation of teletype-writers should be observed when using this test set. Special adjustments must be made whenever testing any equipment which transmits other than a 7.42-unit code length (old style 7-unit characters). (See par. 12.)

Section III. UNPACKING, INSTALLATION, AND PACKING

7. Selecting Location

Place the test set on a convenient work bench or table or on the floor near enough to the equipment to be tested so that connection can be made to the test set. Locate the test equipment so that the cords of the test set do not interfere with exposed wiring and cabling. When the equipment to be tested is located in tents or temporary buildings, select a site for the test set that is as free from moisture and dust as possible. In cases where ground must be provided at the test set, locate the equipment as near as possible to a source of good ground.

8. Uncrating, Unpacking, and Checking

Be careful when unpacking and handling the equipment. When unpacking, follow the steps outlined below:

a. Place the packing case as near the operating position or work bench as possible.

b. Cut the steel straps.

c. Remove the nails with a nail puller and remove the sides and top of the packing case. *Prying the sides and top off may damage the equipment.*

d. Carefully remove the moistureproof covering.

e. Lift the equipment free from the packing case.

9. Physical Checks

a. Check the cords for tightness of connection and damaged insulation.

b. Check the plugs for chips, cracks, and damaged parts.

c. Check the control panels for chips and cracks.

d. Check the stroboscope to insure proper operation.

e. Check the brush holder and the brush arm on the distributor mechanism for bent or damaged places. See that the brushes are seated properly and that they contact the rings evenly.

f. Check spare parts, if any.

10. Packing

After the equipment has been disconnected and removed from service, repack in the same manner as the way in which the equipment arrived before reshipping to any distant point.

PART TWO

OPERATING INSTRUCTIONS

Note. For information on destroying the equipment to prevent enemy use, see destruction notice at the front of this manual.

Section IV. PREOPERATIONAL PROCEDURES

11. Preparation for Use

Before attempting to place Distortion Test Set TS-383/GG into operation, carefully read the instructions covering its use. Be sure to obey all cautions. They are given to guide the user and protect the equipment. Distortion Test Set TS-383/GG normally is adjusted at the factory before being packed for shipment. Before any test set, new or used, is placed in service, however, certain checks should be made.

a. LUBRICATION. Carefully check the equipment to see whether all lubrication requirements are met. If lubrication is required, follow the detailed lubrication instructions given in paragraph 41.

b. MOTOR. Install the motor, pinion, and gears. Turn the motor by hand in the normal direction of operation (counterclockwise). Be sure that there is no binding between the motor pinion and gears, or that there is no binding in other parts of the equipment. If binding occurs, adjust according to instructions in paragraphs 101 and 102.

CAUTION: Do not turn the motor in the wrong direction. This will turn the distributor brushes backwards and cause damage by catching on the edges of the commutator segments.

c. CODE DISK TRANSMITTER. Check to see that all contact tongues and contact springs are undamaged.

d. KEYS, SWITCHES, AND CONTROL KNOBS. Operate all keys, switches, and control knobs to check for freedom of action and possible damage. Check the contacts for dirt, damage, and loose connections.

12. Starting Distortion Test Set TS-383/GG

a. Plug the a-c power cord into a source of 110- to 115-volt, 50- to 60-cycle ac.

b. Turn the MOTOR switch to ON and allow the motor to run a few minutes.

c. If the test set is equipped with a governed motor, adjust motor speed as follows:

(1) Allow the vibrating shutters of a tuning fork above the target hub on the motor governor. There are two tuning forks with Tool Equipment TE-50 (par. 38b), each marked with the number of vibrations per second (vps) of the activated fork. There are 87.6 vps of the fork for 968.1 opm, and 96.1 vps of the fork for 404 opm.

(2) If the motor is operating at the correct speed, the target will appear stationary when viewed through the vibrating shutters. If the motor is too fast, the target will appear to be moving in the direction of rotation. If it is too slow, the target will appear to be moving in the opposite direction.

(3) If the motor speed is too fast, press the governor adjusting bracket against the governor adjusting wheel. This causes the governor adjusting wheel to be turned counterclockwise about one-quarter turn. Recheck the speed and repeat the adjustment if necessary.

(4) If the motor speed is too slow, press the adjusting lever to turn the governor adjusting wheel clockwise about one-quarter turn. Recheck the speed and repeat the adjustment if necessary.

Note. When test sets are equipped with synchronous motors no motor speed adjustment is required.

Section V. OPERATION

13. Operation of Distortion Test Set TS-383/GG

This section gives a detailed step-by-step outline for operating Distortion Test Set TS-383/GG. The tests outlined are:

- a.* Test of teletypewriter selector unit.
- b.* Test of bias meters.
- c.* Test of Test Set TS-2/TG.
- d.* Test of carrier telegraph terminals and repeaters.
- e.* Test of polar relays.
- f.* Test of Relay BK-27-A.

g. Test of transmitting contacts of teletypewriters.

14. Test of Teletypewriter Selector Unit

a. GENERAL. The position of the outer segmented ring of the distributor may be positioned in relation with the inner segmented ring so that the amount of distortion desired will be transmitted with the distortion keys in any position other than ZERO. With the BIAS-END DIST key in its neutral position and the MARK-ZERO-SPACE

key at ZERO, an undistorted signal will be transmitted. The amount of signal distortion is determined by viewing the stroboscope lamp in conjunction with the movable calibration scale. If a governed motor is used, the motor must be kept at the correct speed. Even when correct speed is maintained, there is a slight wavering of the signals. In all tests the current for the signal line should be obtained from an external source.

b. CONNECTIONS. (1) Plug the a-c MOTOR POWER cord into a suitable 110-to 115-volt, 50-

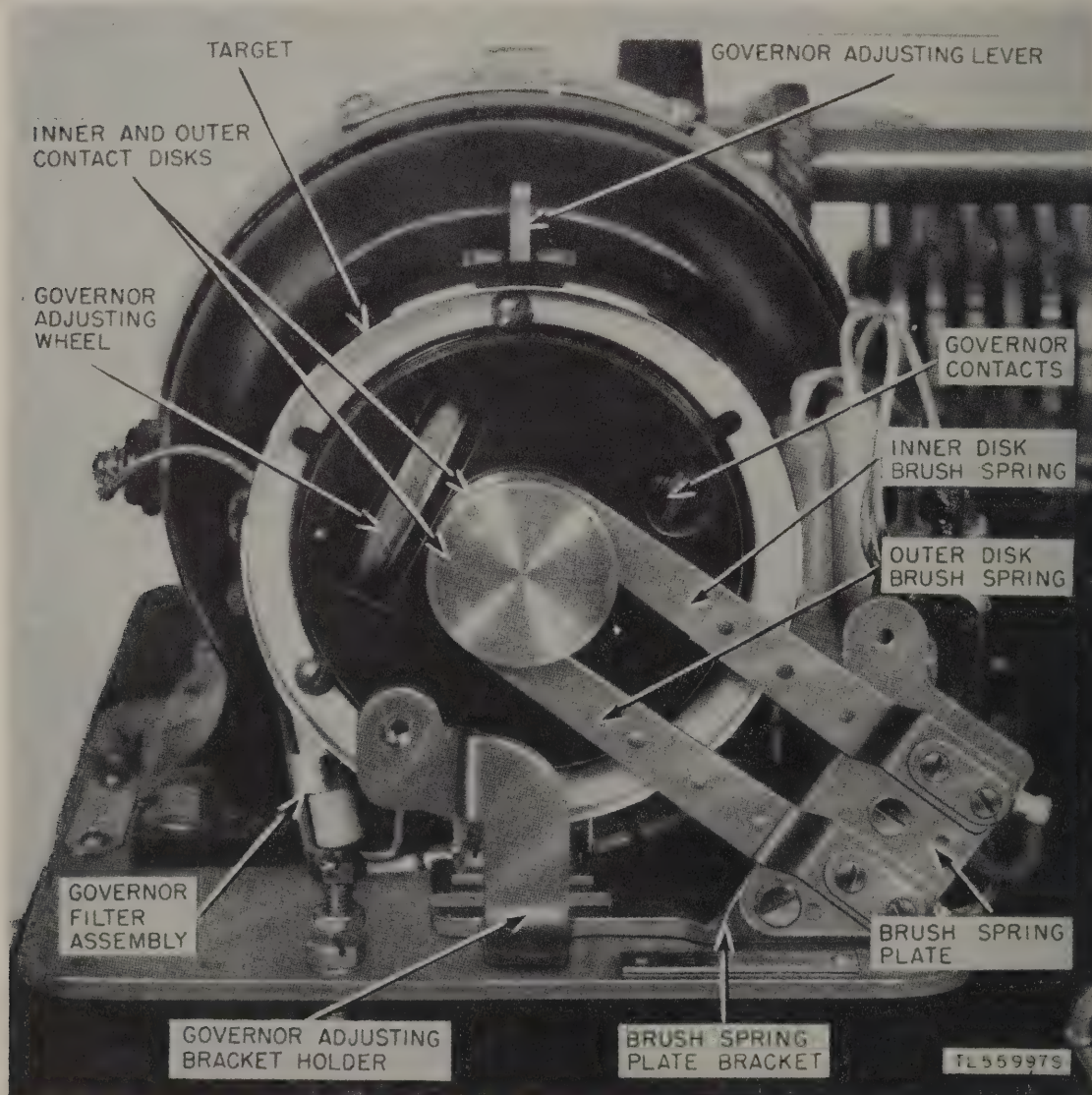


Figure 6. Motor governor assembly, adjusting bracket removed.

to 60-cycle a-c power source.

(2) Connect the red and black plugs of the 110-V D-C leads to a suitable 110-volt d-c source. A rectifier, if available, may be used for this purpose. Be sure to connect the proper polarity so that maximum brilliance is obtained for the neon tracer light. If suitable polarized d-c jacks are not available for the red and black plugs, replace the 110-V D-C cords with a two-conductor cord having a polarized plug.

(3) Connect the SIGNAL LINE cord to the LINE terminals of Line Unit BE-77-(). Use a suitable female plug and a length of two-conductor cord to make this connection.

Note. It is not necessary to connect the STROBOSCOPE cord when testing selector units. This cord is used only when checking the quality of signals transmitted by relays, transmitter-distributors, etc.

(4) Connect the power cord of Line Unit BE-77-() to a 115-volt d-c power source. Turn the relay switch to RELAY OUT and throw the toggle switch to LOCAL CURRENT SUPPLY. Adjust the line rheostat to obtain a 60-milliamperereading on the meter.

(5) Plug the sending and receiving cords of the teletypewriter into the PRINTER BLACK and RED jackets of Line Unit BE-77-().

(6) Connect the a-c power cord of the teletypewriter to an a-c outlet and turn the motor switch ON.

(7) Turn the MOTOR switch of Distortion Test Set TS-383/GG to ON.

Note. If either the test set or the teletypewriter or both are equipped with a governed motor, adjust the motors to the same operating speed. (See par. 12.)

c. TEST FOR ZERO BIAS. (1) To test teletypewriter apparatus locally for zero bias, place the keys and switches of Distortion Test Set TS-383/GG in the following positions:

RUN-STOP switch.....	STOP
LINE-DIST key	DIST
BIAS-END DIST key.....	Neutral
VIEW-TRANSMIT key	VIEW
MARK-ZERO-SPACE key	ZERO
Code selecting switch.....	R or Y
STOP PULSE switch.....	ON

(2) With the keys and switches in the above positions, the stroboscope lamp should light for 100 scale divisions on the graduated scale for each marking impulse and 142 scale divisions for each stop impulse. If necessary, rotate the graduated

distortion measure scale until it coincides with the respective impulses.

(3) Rotate the RUN-STOP switch to the RUN position, the code selecting switch to the TEST MESSAGE position, and place the VIEW TRANSMIT key on TRANSMIT.

Note. Signals cannot be viewed on the stroboscope when they are being transmitted. The signal line to the receiving unit will be open when the signals are viewed on the stroboscope unless the RUN-STOP knob is on STOP.

(4) When determining the limits of zero bias, operation is generally assumed to be correct when two 72-character lines are received with only one error. The minimum zero-bias requirement for new machines is 72 percent.

d. TEST FOR MAXIMUM BIAS. (1) To determine the maximum bias the receiving selector will permit, place the keys and switches of Distortion Test set TS-383/GG in the following positions

RUN-STOP switch.....	STOP
LINE-DIST key.....	DIST
BIAS-END DIST key.....	BIAS
VIEW-TRANSMIT key.....	VIEW
MARK-ZERO-SPACE key.....	MARK
Code selecting switch.....	R or Y
STOP PULSE switch.....	ON

(2) Adjust the distortion control until the marking impulses each occupy 135 scale divisions. The signals will then be biased by 35 percent marking.

CAUTION: Do not adjust the distortion control when the distributor disk is stationary. This may damage the distributor brush associated with the movable segmented ring.

(3) Transmit distorted signals by setting the RUN-STOP switch to RUN, the code selecting switch to TEST MESSAGE, and by placing the VIEW-TRANSMIT key in the TRANSMIT position. Determine the upper limit of the range of the selector unit with the marking bias applied.

(4) Change the 35 percent marking bias distortion to spacing bias distortion by placing the MARK-ZERO-SPACE key on SPACE. Determine the lower limit of the range with the spacing bias applied.

(5) Find the maximum amount of bias in equal amounts, either marking or spacing, that the selector unit under test can withstand by using the following formula:

$$\text{Maximum bias} = \frac{35 + \text{marking bias} - \text{spacing bias}}{2}$$

(6) For maximum accuracy, the distortion introduced by the test set should be equal to the maximum distortion tolerance in the teletype-writer selector unit. The minimum bias requirement for new machines is 40 percent.

(7) Determine the correct orientation setting for the range finder of the selector unit under test on signals containing either marking or spacing bias distortion from the following:

$$\text{Setting for bias} = \frac{\text{Upper limit marking bias} + \text{Lower limit spacing bias}}{2}$$

e. TEST FOR MAXIMUM END DISTORTION. (1) To measure the amount of end distortion the selector mechanism of the receiving teletypewriter unit will withstand, place the keys and switches in the following positions:

RUN-STOP switch.....STOP
 LINE-DIST key.....DIST
 BIAS-END DIST key.....END DIST
 VIEW-TRANSMIT key.....VIEW
 MARK-ZERO-SPACE key.....MARK
 Code selecting switch.....R or Y
 STOP PULSE switch.....ON

(2) Adjust the distortion control until the marking impulses each occupy 65 scale divisions. The signals will then have 35 percent marking end distortion.

(3) Transmit distorted signals by setting the RUN-STOP switch to RUN, the code selecting switch to TEST MESSAGE, and by placing the VIEW-TRANSMIT key in the TRANSMIT position. Determine the upper limit of the range with the 35 percent marking end distortion applied to the signals.

(4) Change the 35 percent distorted signals to spacing end distortion by shifting the MARK-ZERO-SPACE key to SPACE. Determine the lower limit of the range with 35 spacing end distortion applied.

(5) Find the maximum amount of end distortion the unit can withstand by using the following formula:

$$\text{Maximum end distortion} = \frac{\text{Upper limit marking end distortion} - \text{Lower limit spacing end distortion}}{2}$$

(6) The minimum end distortion requirement for new machines is 35 percent.

(7) Determine the correct orientation point for the range finder of the selector unit under test on signals containing end distortion from the following:

$$\text{Setting for end distortion} = \frac{\text{Upper limit marking end distortion} + \text{Lower limit spacing end distortion}}{2}$$

f. CALCULATING INTERNAL BIAS. (1) Calculate the internal bias of the receiving selector unit under test by finding the difference between the orientation setting for bias distortion (*d*(7) above) and the orientation point for end distortion (*e*(7) above).

(2) Internal bias should not exceed six points.

15. Test of Bias Meters

a. LINE UNIT BE-77-(). (1) It is not necessary to remove the bias meter from Line Unit BE-77-() for testing and calibration. Remove any plugs or teletypewriter connections from the line unit.

(2) Adjust the meter pointer to zero by adjusting the small screw on the front of the meter. Short the line terminals and remove the line unit relay.

(3) Connect alligator clips to a length of two-conductor cord, and connect the SIGNAL LINE cord of Distortion Test Set TS-383/GG to the cord with a suitable female plug. Fasten the clips securely to the center and top center terminals of the relay mounting block on Line Unit BE-77-().

(4) Connect the line unit to its regular d-c power source.

(5) Set the keys and switches on Distortion Test Set TS-383/GG as follows:

MOTOR switch.....ON
 RUN-STOP switch.....RUN
 LINE-DIST key.....DIST
 BIAS-END DIST key.....Neutral
 VIEW-TRANSMIT key.....TRANSMIT
 MARK-ZERO-SPACE key.....ZERO
 Code selecting switch.....T
 STOP PULSE switch.....OFF

Note. When the STOP PULSE is OFF and the code selecting switch is at T, the stop impulse is disconnected and a continuous marking impulse is transmitted. This has the effect of transmitting a repeated space signal.

(6) Set the meter switch on Line Unit BE-77-() to BIAS.

(7) With Distortion Test Set TS-383/GG transmitting undistorted signals the bias meter

should indicate zero. If it does not, adjust the small rheostat in the front of the line unit by first removing the nut which forms a cap cover and then turning the adjusting screw with a screw driver until the meter shows zero bias. Tighten the cap on the rheostat securely to prevent accidental turning of the adjusting screw.

b. SWITCHBOARD BD-100. (1) It is not necessary to remove the bias meter from Switchboard BD-100 for testing and calibration, nor is it necessary that the switchboard be removed from service.

(2) Connect Distortion Test Set TS-383/GG to the bias meter circuit of the switchboard by plugging the SIGNAL LINE cord into the bias meter jack of the switchboard.

(3) Connect the switchboard to its regular source of dc.

(4) Set the keys and switches on Distortion Test Set TS-383/GG to the following positions:

MOTOR switch.....ON
RUN-STOP switch.....RUN
LINE-DIST key.....DIST
BIAS-END DIST key.....Neutral
VIEW-TRANSMIT key.....TRANSMIT
MARK-ZERO-SPACE key.....ZERO
Code selecting switch.....T
STOP PULSE switch.....OFF

(5) Set the meter switching key of Switchboard BD-100 to BIAS.

(6) With Distortion Test Set TS-383/GG transmitting undistorted signals, the bias meter should indicate zero. If the meter does not indicate zero, adjust the rheostat, located in back of the switchboard, until zero bias is obtained.

16. Test of Test Set TS-2/TG

Distortion Test Set TS-383/GG may be used to check various operations of Test Set TS-2/TG. When performing any tests on Test Set TS-2/TG it is preferable to use synchronous motors on both test sets because an accurate check of the calibration adjustment cannot be made with the variation in speed caused by governed motors. Any speed variation will cause a wavering of the impulses as viewed on the stroboscope, making it difficult to measure accurately the impulse length.

a. Connect the a-c MOTOR POWER cord to a suitable 110- to 115-volt, 50- to 60-cycle a-c source.

b. Plug the STROBOSCOPE cord into one of the LOCAL TEST JACKS of Test Set TS-2/TG.

c. Plug the line plug of Test Set TS-2/TG into the other LOCAL TEST JACK. This provides a

source of dc for the signal and for the stroboscope lamp.

d. Place the radio filter cut-out switch on Test Set TS-2/TG in the OUT position during the time that the test set is being checked. This prevents signal distortion in the form of a tailing effect as viewed on the stroboscope.

e. Place the keys and switches on Distortion Test Set TS-383/GG in the following positions:

MOTOR switch.....ON
RUN-STOP switch.....RUN
LIST-DIST key.....LINE
BIAS-END DIST key.....Neutral
VIEW-TRANSMIT key.....TRANSMIT
MARK-ZERO-SPACE key.....ZERO
Code selecting switch.....R or Y
STOP PULSE switch.....ON

f. Set the selector switch on Test Set TS-2/TG for the desired signal.

g. If governed motors are used and the signal trace on the stroboscope of Distortion Test Set TS-383/GG appears to creep, adjust the motor speeds of the two test sets to be as identical as possible. (See par. 12.)

17. Test of Carrier Telegraph Terminals and Repeaters

a. GENERAL. Test Set TS-383/GG may be used to transmit unbiased or biased teletypewriter signals in making operational tests of carrier telegraph terminals and repeaters. In making these tests, signals transmitted from the test set will operate a terminal or repeater known to be in good operating condition to transmit to the terminal or repeater under test. The operating margin of a teletypewriter connected to the terminal or repeater under test determines the operating condition of the terminal or repeater.

b. CONNECTIONS. (1) Connect the carrier equipment in good operating condition to the equipment under test in the normal manner. Line up the equipment as described in the applicable Technical Manual.

(2) Connect the a-c MOTOR POWER cord of Distortion Test Set TS-383/GG to the convenience outlet on the carrier telegraph equipment in good operating condition.

(3) Connect the 110-V D-C cords to a convenient source of 110-volt d-c. The cords may be plugged into the d-c jack field on the carrier equipment. Be careful to observe the polarity of the cords.

(4) Connect the SIGNAL LINE cord of the test

set to the sending circuit of the carrier equipment in good operating condition.

(5) Connect the STROBOSCOPE cord to the repeated signal circuit of the carrier equipment.

(6) Connect a teletypewriter with a local range of orientation of at least 70 points to the receiving circuit of the carrier equipment under test.

c. TEST. (1) With the keys and switches on Distortion Test Set TS-383/GG in the positions listed below, send from the test set and measure the range of orientation of the teletypewriter. This range should be within 10 points of the local range if the system is in proper condition.

Motor switch.....	ON
RUN-STOP switch.....	RUN
LINE-DIST key.....	LINE
BIAS-END DIST key.....	Neutral
VIEW-TRANSMIT key.....	TRANSMIT
MARK-ZERO-SPACE key.....	ZERO
Code selecting switch.....	R or Y
STOP PULSE switch.....	ON

(2) Reverse the direction of transmission and, with the key and switch settings on Distortion Test Set TS-383/GG changed as follows, repeat the measurement.

RUN-STOP switch.....	STOP
LINE-DIST key.....	DIST
VIEW-TRANSMIT key.....	VIEW

(3) Make tests on all channels and all loop operations except two-path polar and polarantial.

(4) The difference between the perfect transmitted signal and the repeated signal is the amount of distortion introduced by the terminal or repeater under test.

18. Test of Polar Relays

a. GENERAL. Polar relays may be tested for faulty operation with Distortion Test Set TS-383/GG by comparing the signals obtained locally with the signals after they have passed through the relay. The signals transmitted by the test set will operate the relay, and the relay contacts will make and break the circuit to the stroboscope lamp.

b. CONNECTIONS. (1) Remove any filter or protective capacitor connected to the contacts of the relay under test. Otherwise, an incorrect indication on the stroboscope may result.

(2) Connect the a-c MOTOR POWER cord of Distortion Test Set TS-383/GG to a source of 110- to 115-volt, 50- to 60-cycle ac.

(3) Connect the 110-V D-C cords to a source of 110-volt dc.

(4) Connect the circuit of the operating winding of the relay to the SIGNAL LINE cord. Use a length of two-conductor cord and a suitable female plug to make the connection.

(5) Connect the repeated signal circuit from the relay contacts to the STROBOSCOPE cord, making the connection with a length of two-conductor cord and a suitable female plug.

c. TEST. (1) Supply external line battery to the relay contacts and the stroboscope. To view the input and output signals of the relay, set the keys and switches on Distortion Test Set TS-383/GG in the following positions:

	<i>Local signals</i>	<i>Repeated signals</i>
Motor switch.....	ON	ON
RUN-STOP switch.....	STOP	RUN
LINE-DIST key.....	DIST	LINE
BIAS-END DIST key.....	Neutral	Neutral
VIEW-TRANSMIT key.....	VIEW	TRANSMIT
MARK-ZERO-SPACE key.....	ZERO	ZERO
Code selecting switch.....	R or Y	R or Y
STOP PULSE switch.....	ON	ON

(2) The difference between the perfect local signal and the repeated signal is the amount of distortion introduced by the relay.

(3) The polar relay is designed to receive signals with some distortion and to retransmit these signals with zero distortion. Test the relay for maximum bias distortion and maximum end distortion in the same way as a teletypewriter selector unit (par. 14d and e) by viewing the retransmitted signals.

(4) The relay should retransmit perfect signals on input signals containing as much as 40 percent bias distortion or 35 percent end distortion.

Note. Test Set I-193-A or the relay test circuit provided in Telegraph Terminals CF-2-() and CF-6 should be used in preference to the above method when available.

19. Test of Relay BK-27-A

Distortion Test Set TS-383/GG may be used, with special circuits, for a very accurate check on the adjustments of Relay BK-27-A. Directions for constructing the special circuits necessary to make this test are given in the Technical Manuals furnished with Switchboard BD-100.

20. Test of Transmitting Contacts of Teletypewriters

a. Connect the a-c MOTOR POWER cord of

distortion Test Set TS-383/GG to a source of 110 to 115-volt, 50- to 60-cycle ac.

b. Connect the 110-V D-C cords to a source of 110-volt dc.

c. Connect the signal circuit from the transmitting contacts of the teletypewriter to the STROBOSCOPE cord with a suitable length of two-conductor cord and a female plug. The SIGNAL LINE cord need not be connected.

d. With external battery supplied for the transmitting contacts and the stroboscope, set the keys and switches on Distortion Test Set TS-383/GG in the following positions:

MOTOR switch.....	ON
RUN-STOP switch.....	RUN
LINE-DIST key.....	LINE
BIAS-END DIST key.....	Neutral
VIEW-TRANSMIT key.....	TRANSMIT
MARK-ZERO-SPACE key.....	ZERO
Code selecting switch.....	R or Y
STOP PULSE switch.....	ON

e. Hold the selector magnets closed by hand or in some mechanical way, such as turning the trip-off eccentric screw, to keep the machine running closed when the armature is in the spacing position. This is necessary because the stroboscope lamp presents an open to the line circuit.

f. Test each contact individually by sending repeated E, LINE FEED, SPACE, CARRIAGE RETURN, and T combinations from the teletypewriter. Send the repeated signal combinations by holding down the desired key and at the same time holding the space repeat rod against the intermediate pawl.

g. Any deviation from 100 percent in impulse length probably would be caused by maladjustment of the respective pair of contacts. The stop signal is an exception as it should be 142 percent in length. The stop impulse cannot be eliminated from the stroboscope because the impulses received from the teletypewriter do not go through the segmented distributor rings.

Section VI. ROUTINE OPERATION CHECKS

21. Records

Keep a record for each test set showing the date it was placed in service, results of each periodic maintenance check, troubles experienced, and when and how troubles were cleared. Such records will assist greatly in locating troubles and eliminating potential causes of complete service failure.

22 Purpose and Use of Equipment Performance Check List

a. GENERAL. The equipment performance check list (par. 23) will help in determining whether Distortion Test Set TS-383/GG is functioning properly. The check list gives the items to be checked, the normal indications and tolerances of correct operation, and paragraph references to the corrective measures in part five. Items 1 through 6 constitute the initial line-up and are checked when the set is about to go into operation after having been shut down. Items 7 through 12 correspond to the daily checks that are made while in operation. Items 13 through 16 are the operations performed when stopping the test set.

b. ACTION OR CONDITION. For some items the information given in the action or condition column consists of the setting for various switches and controls under which the item is to be checked. For other items it represents an action that must be taken in order to check the normal indications given in the normal indications column.

c. NORMAL INDICATIONS AND CORRECTIVE MEASURES. The normal indications listed include the visible and the audible signs that will be found when the items are checked. If the indications are not normal, an experienced mechanic should apply the recommended corrective measures.

23. Equipment Performance Check List for Distortion Test Set TS-383/GG

	Item No.	Item	Action or condition	Normal indications	Corrective measures
PREPARATORY	1	A-c MOTOR POWER cord.	Connect to 110- to 115-volt, 50- to 60-cycle a-c supply.		
	2	Polarized 110-V D-C cords.	Connect to 110-volt d-c supply.		
	3	SINGLE LINE cord.	Connect to equipment under test, directly or through external signal circuit.		
	4	STROBOSCOPE cord.	Connect to signal circuit of equipment under test for other than local tests.		
START	5	MOTOR switch.	Turn to ON.	Motor starts. Distributor brushes move in clockwise direction.	See paragraph 59.
	6	Motor governor target.	Observe through vibrating shutters of correct tuning fork.	Target remains stationary.	See paragraph 12.
EQUIPMENT PERFORMANCE	7	Character selecting switch. LINE-DIST key. BIAS-END DIST key. MARK-ZERO-SPACE key.	Set to desired signal. Set to DIST. Set to neutral position. Set to ZERO.	Selected signal transmitted to equipment under test with zero distortion.	See paragraph 59.
	8	Character selecting switch. LINE-DIST key. BIAS-END DIST key. MARK-ZERO-SPACE key.	Set to desired signal. Set to DIST. Set to BIAS. Set to MARK or SPACE.		
	9	Character selecting switch. LINE-DIST key. BIAS-END DIST key. MARK-ZERO-SPACE key.	Set to desired signal. Set to DIST. Set to END DIST. Set to MARK or SPACE.		
	10	RUN-STOP switch. VIEW-TRANSMIT key.	Set to RUN. Set to TRANSMIT.		
	11	RUN-STOP switch. VIEW-TRANSMIT key.	Set to STOP. Set to VIEW.	Signal line short-circuited. Transmitted signal can be seen.	See paragraph 59.
	12	STOP PULSE switch. Character selecting switch.	Set to OFF. Set to T.	Unbroken signal transmitted to equipment under test.	See paragraph 59.
STOP	13	MOTOR switch.	Turn to OFF.	Motor stops.	
	14	A-C MOTOR POWER cord	Disconnect.		
	15	Polarized 110-V D-C cords.	Disconnect.		
	16	SIGNAL LINE and STROBOSCOPE cords.	Disconnect.		

PART THREE

MAINTENANCE INSTRUCTIONS

Note. The preventive maintenance instructions in this part will serve as a guide for any of the installations or groups of equipment for which the equipment is designed. *Do not attempt to do unauthorized maintenance on this equipment.*

Section VII. PREVENTIVE MAINTENANCE TECHNIQUES

24. Meaning of Preventive Maintenance

Preventive maintenance is a systematic series of operations performed at regular intervals on equipment when the equipment is not in the operating circuits. Preventive maintenance operations are designed to eliminate major break-downs and unwanted interruptions in service, and to keep equipment operating at top efficiency. To understand what is meant by preventive maintenance, it will be necessary to distinguish from trouble shooting and repair. The prime function of preventive maintenance is to prevent break-downs and, therefore, the need for repair. The prime function of trouble shooting and repair is to locate and correct *existing* defects. The importance of preventive maintenance cannot be overemphasized. The entire system of teletypewriter communication depends on each set being in *operation* when it is needed and upon its *operating efficiently*. It is vitally important that teletypewriter operators and repairmen maintain their equipment properly.

Note. Most of the operations in paragraphs 24 through 39 are first and second echelon (organization repairmen) maintenance. Some operations in paragraphs 40 and 41 and paragraphs 42 through 45 are third or higher echelon maintenance.

25. Description of Preventive Maintenance

a. GENERAL. Most of the mechanical and electrical parts used in teletypewriter equipment require routine preventive maintenance. Those requiring maintenance differ in the amount and kind required. Because hit-or-miss maintenance methods are not reliable, definite and specific instructions are needed. This section contains these specific instructions and serves as a guide for personnel

assigned to perform the six basic maintenance operations: Feel, Inspect, Tighten, Clean, Adjust, and Lubricate. Throughout this manual, the following lettering system is used for the six operations:

F—Feel
I—Inspect
T—Tighten
C—Clean
A—Adjust
L—Lubricate

The first two operations, completed with the aid of necessary tools and test equipment, establish the need for the other four. The selection of operations is based on the general knowledge of field needs. For example, dust existing in ordinary rooms will filter into the equipment no matter what care is taken to prevent it. Rapid changes in weather (such as heavy rain followed by blistering heat) and excessive dampness will cause corrosion of exposed parts. Without frequent inspections and the performance of necessary tightening, cleaning, adjusting, and lubrication operations, equipment will become undependable and subject to break-down.

b. FEEL (F). The feel operation is most often used to check rotating machinery such as motors, cams, shafts, etc., and to determine if electrical connections, bushings, etc., are overheated. Feeling indicates the need for lubrication or the existence of similar types of defects requiring correction. Many motors used in teletypewriter equipment operate at relatively high temperatures. The maintenance man must become familiar with the normal operating temperatures of the equipment in order to be able to recognize signs of overheating.

Note. The feel operation must be performed as soon as possible after shut-down of the equipment and always before any other maintenance is performed.

c. INSPECT (I). Inspection is the most important operation in the maintenance program. The inspector must know how to inspect for required clearances, tensions, and adjustments of the vari-

ous types of mechanical assemblies. A careless person will be prone to overlook the evidences of minor trouble. Although these minor defects may not interfere with the performance of the equipment, valuable time and effort can be saved if they are corrected before they lead to major breakdowns. Make every effort to become thoroughly familiar with the indications of normal operation in order to be able to recognize signs of defective equipment. Inspection consists of carefully observing and checking with tools, gauges, etc., when they are required, all parts of the equipment. Notice state of cleanliness, lubrication, amount of wear and adjustment, placement, tightness, clearance, overheating, and moisture accumulation. Inspect for the conditions as follows:

(1) Cleanliness, by carefully examining all surfaces of the unit for accumulations of dust and dirt and excessive oil or grease. Parts, connections, and joints should be free of dust, corrosion, and other foreign matter. In tropical and high-humidity locations, look for fungus growth, mildew, and moisture collection.

(2) Inadequate or excessive lubrication.

(3) Excessive wear, as indicated by loose bearings, fittings, etc.

(4) Adjustment and placement, by determining that all mechanical and electrical parts are properly adjusted and in their original position.

(5) Tightness, by testing any connection, assembly, or mounting that is normally fastened in a rigid position.

CAUTION: Before tightening any screws, bolts, or nuts, determine whether or not they are any part of any adjustment. If so, tighten in accordance with detailed requirement and adjustment procedures given in paragraphs 80 through 111 and check all related adjustments.

(6) Clearance between specified points, by feeling, sighting, or inserting gauges as specified for the item inspected.

(7) Spring tension, by using the appropriate special spring scale in the exact manner described in each spring tension requirement.

(8) Overheating, as indicated by discoloration, blistering, or bulging of parts or surfaces of the container, by leakage of insulating compounds, and by oxidation of metal contact surfaces.

d. TIGHTEN (T). This operation applies only to bolts, screws, and fasteners holding items rigidly in place. Correct tightening procedure requires

use of the proper type and size of tool. Screws, bolts, and nuts should not be tightened carelessly. Fittings tightened beyond the pressure for which they are designed will be damaged or broken.

CAUTION: Do not tighten parts or apparatus requiring clearance or tension adjustments.

e. CLEAN (C). (1) This operation as applied to external surfaces of cabinets, bases, panels, frames, etc., is the normal cleaning process.

(2) Cleaning equipment interiors including delicate mechanical and electrical parts requires detailed specific instructions for each assembly and unit. This cleaning is normally performed as part of the preventive maintenance routines described in subsequent paragraphs.

(3) Detailed cleaning instructions for major overhauls are given in paragraphs 60 through 79.

(4) Scheduled items marked C need not be cleaned each time they are inspected. Clean parts only when inspection shows that it is necessary.

f. ADJUST (A). Adjustments are made only when they are necessary to restore normal operating conditions. Use extreme care in selecting proper tools and gauges before making adjustments. Many adjustments must be made in particular sequence. Each adjustment must meet *all* requirements for clearance, tension, speed, and other tolerance limits. If one adjustment is changed, *all* related adjustments must be checked. This check may involve a certain amount of duplication, but there are no practical short cuts when making overlapping functional adjustments. Detailed instructions for specific requirements and adjustments are given in paragraphs 80 through 111.

g. LUBRICATE (L). Lubrication refers to the application of oil or grease to all rotating shafts and bearings, cam rollers, sliding surfaces, and other moving parts. It may include the application of oil to metal surfaces on parts of the equipment. All lubrication should be done in accordance with instructions in paragraph 41.

26. Exterior of Test Set

The following preventive maintenance procedures for the exterior of the test set are elementary operations which should be performed by the operator without detailed instructions.

a. INSPECT (I). Inspect surfaces for cracked or chipped enamel. Check for cracked or broken switch and control knobs and key handles. Look to see if the visor hood is fitting correctly and

that it is not bent. Rotate the front disk cover to see that it moves freely and that it will not turn in the reverse direction. Check the movement of the signal measuring scale ring. The scale should move smoothly and without excessive binding, but should still have enough friction with the retaining segments to hold its position.

b. **TIGHTEN (T).** Tighten all the screws holding the frame cover, replacing any that are missing. Tighten all the key mountings and key handles. Check the screws holding the front disk cover in place.

c. **CLEAN (C).** Wipe off oil, dirt, and excessive moisture with a clean, dry cloth. Remove the visor hood and clean the graduated scale thoroughly.

d. **ADJUST (A).** If units equipped with a brake on the signal measuring scale ring require adjustment, adjust the brake and spring according to instructions in paragraph 95.

27. Cords and Plugs

The following preventive maintenance procedures for cords and plugs are for all connections of this type used on teletypewriter equipment. It includes all connections that have been made at the factory, by the maintenance depot, or by the repairman.

a. **INSPECT (I).** Inspect cords for cracked or deteriorated insulation, frayed or cut insulation at connecting points, and improper connections which strain the wires or connections. Inspect for cracked or damaged plug shells.

b. **TIGHTEN (T).** Remove the plug shells and tighten the connections. Tighten the connection on the power cord. Tighten the metal case. Check to see that the connections on the terminal blocks are secure. Tighten the supporting links that hold the cords in place.

c. **CLEAN (C).** Wipe grease, oil, and moisture from the cords and plugs with a clean, dry cloth. Clean any corrosion or stains from the plugs with polish, metal, paste (Sig C stock No. 6G1516) secured through regular supply channels.

28. Gears and Shafts

Gear and shaft units are made of durable material and seldom need repair or replacement. Proper preventive maintenance, however, will give an almost positive insurance that no trouble will arise from this direction.

a. **INSPECT (I).** Inspect for dirt, corrosion, moisture, and excessive lubrication. Check the locking nuts, bushings, and cotter keys for looseness. Feel

the bearings as soon as possible after shut-down for signs of overheating. Check by sight for any signs of shafts and gears that are bent or out of line. Look the gears over for missing or broken teeth and excessive backlash.

b. **TIGHTEN (T).** Tighten loose locking nuts with a suitable open-end wrench.

c. **CLEAN (C).** Wipe all excessive oil or grease from nonbearing surfaces, wiping in a direction away from bearing surfaces. Leave a slight film to prevent corrosion. If there is any corrosion, clean it off with polish, metal, paste (Sig C stock No. 6G1516). Wipe off all dirt, dust, and moisture with a clean, dry cloth.

d. **ADJUST (A).** Adjust any gears or cams that are out of adjustment.

e. **LUBRICATE (L).** Lubricate according to specific instructions given in paragraph 41.

29. Code Disk Assembly

a. **INSPECT (I).** Inspect for dirt, moisture, and corrosion. Look for missing nuts, lockwashers, and spacers. Inspect for bent or damaged code disks. Inspect the felt oil wick to see that it is free from dirt and grit and that it rests against the cam surfaces.

b. **CLEAN (C).** Wipe off all dirt, moisture, and excessive oil and grease with a clean, dry cloth. Remove corrosion with polish, metal, paste (Sig C stock No. 6G1516).

c. **ADJUST (A).** Adjust the code disk assembly according to instructions in paragraphs 91 through 93. *These adjustments should be made by a qualified mechanic.*

d. **LUBRICATE (L).** Lubricate according to instructions in paragraph 41.

30. Code Selecting Cylinder and Transmitting Contact Assembly

a. **INSPECT (I).** Inspect for dirt, corrosion, and excessive wear. Operate the code selecting switch a few times. Observe any sluggishness or drag of the code selecting cylinder, and check the gap and follow of the contacts. A visual check is sufficient for routine purposes. Inspect for inadequate or excessive lubrication. Check the locking screw for looseness.

b. **TIGHTEN (T).** If necessary, tighten the lock ing screw with a suitable screw driver.

c. **CLEAN (C).** Wipe off excessive oil, grease, or lubrication from the code selecting cylinder with a clean, dry cloth. Clean off any corrosion with

polish, metal, paste (Sig C stock No. 6G1516). Clean dust or dirt from the contacts with a soft bristle brush. If the contacts are corroded, remove corrosion with No. 0000 sandpaper or by flushing with carbon tetrachloride as for key contacts. (See par. 37b.)

d. ADJUST (A). Adjust according to instructions in paragraph 83.

e. LUBRICATE (L). Lubricate according to instructions in paragraph 41.

31. Transmitting Contact Bail and Extension

a. INSPECT (I). Inspect the spring for proper tension. Inspect the bail and extension for dirt, corrosion, and excessive lubrication.

b. CLEAN (C). Wipe dirt and excessive lubrication from the bail and extension with a clean, dry cloth. Clean corroded parts with polish, metal, paste (Sig C stock No. 6G1516). Carefully wipe off all excessive polish.

c. ADJUST (A). Adjust the tension of the spring according to instructions in paragraph 90.

d. LUBRICATE (L). Lubricate as directed in paragraph 41.

32. Motor

a. FEEL (F). Feel the motor for excessive heating as soon as possible after the test set has been taken out of operation. Feel the amount of play in the bearings to judge whether they are showing signs of excessive wear. This can be done by grasping the motor governor or fan and rotating or wiggling with the hand.

b. INSPECT (I). Inspect the surface of the motor for dirt, dust, and oil. Look for excessive lubrication. Inspect for loose, dirty, or corroded connections. Check to see that the motor is mounted securely in its proper place. Inspect commutator segments for dirt and corrosion. If the motor is a governed motor, inspect the governor contacts, brushes, disks, and springs for damage, wear, and adjustment. Check the motor speed.

c. TIGHTEN (T). If the motor is mounted correctly, tighten all loose connections and motor mounting screws and bolts.

d. CLEAN (C). Wipe off all moisture, oil, grease, dust, and dirt with a clean, dry cloth.

e. ADJUST (A). Adjust the motor unit in accordance with the instructions given in paragraphs 101 through 110.

f. LUBRICATE (L). Lubricate according to specific instructions given in paragraph 41. Avoid

over lubrication as this will cause burned out starting switches and overheated bearings.

33. Capacitors and Resistors

Capacitors and resistors are items which generally require replacement by an authorized repairman. There are, however, several preventive maintenance procedures that can be done by the operator.

a. INSPECT (I). Inspect for loose or corroded connections, for cracked or damaged insulation, and for discoloration or bulging indicating excessive heating at some time.

b. CLEAN (C). Clean oil or grease from the units with a dry cloth. Wipe off excessive moisture with a clean, dry cloth. Clean dirty or corroded connections. Loose soldered connections should be repaired by an experienced repairman.

34. Terminal Blocks

Terminal blocks, which are used as receiving, connecting, and distributing points for electrical circuits, consist of a strip of insulation with screw or solder connections. They require little preventive maintenance, especially if the equipment has not been removed.

a. INSPECT (I). Inspect terminal blocks for loose connections, cracks, breaks, and dirt. Carefully examine the connections for mechanical defects, dirt, and corrosion.

b. TIGHTEN (T). Tighten loose screws, bolts, and mounting lugs. Use a screw driver of the correct size. Do not use excessive force. Remove and clean dirty or corroded connections before tightening.

c. CLEAN (C). Clean terminal blocks, when necessary, with a dry brush. Wipe off excessive moisture with a clean, dry cloth. When necessary, use a cloth moistened with dry-cleaning solvent (SD), then wipe off the block thoroughly with a dry cloth and brush the block to remove all lint.

35. Wiring

a. INSPECT (I). Inspect for cracked, frayed, or torn insulation. Check for loose connections, dirty contacts, and faulty lacing. Look for any wiring which may be bearing on rotating parts.

b. TIGHTEN (T). Tighten all screw connections which may be loose. Resolder loose or broken soldered connections. Place all wiring in the proper

place and retie if necessary. Soldering should be done by an experienced repairman.

c. **CLEAN (C).** Clean off all moisture, oil, and grease from the wiring with a clean, dry cloth. Clean all connections before reconnecting.

36. Distributor Assembly

Remove the visor hood and the front cover disk to get at the rings and brushes. Do not attempt to do more than the preventive maintenance procedures call for. Any further repairs should be done by an authorized repairman.

a. **INSPECT (I).** Check for dirt, corrosion, and loose parts. Inspect the wiring and soldered connections for broken or loose connections. Check the brushes for wear and proper contact. The brushes should be secure in their holders. The ends should not be splayed and should rest against the central portion of the rings with light pressure. See that the light is securely fastened in its proper place so that it will give maximum brilliance through the lamp arm slot. Inspect the rings for dirt, corrosion, pits, and rough spots. The segment gaps should also be clean. Do not mistake the dark brown stain usually present on all rings for corrosion. This is a coating of oxide and lengthens the life of the rings.

b. **CLEAN (C).** Wipe off all moisture, dirt, oil, and grease with a clean, dry cloth. Remove corrosion from the rings with polish, metal, paste (Sig C stock No. 6G1516), secured through regular supply channels, and a clean, dry cloth. If metal polish is used, thoroughly clean the segment gaps after polishing the rings. If the rings are rough, burned, or pitted, use a fine grade of sandpaper, brushing the segments off afterwards to remove any metal dust that may cause short circuits.

c. **ADJUST (A).** Adjust the rings and brushes in accordance with the specific instructions given in paragraphs 82 and 97 through 99. *Do not attempt to make any unauthorized adjustments.*

37. Keys and Switches

All keys and switches are of a common class and no specific instructions are given for any particular key.

a. **INSPECT (I).** Inspect the mechanical action of each key or switch and look for signs of dirt and corrosion on all exposed elements. Examine the keys both visually and by observing the action of the key or switch by flipping them a few times. Notice the amount of spring tension and freedom

of action. To inspect the key contacts, remove the motor toggle switch and the switch designation plate. Remove the individual mounting screws of the keys. Be careful when handling the keys. Do not disconnect the wiring. See if the contacts are clean and free from corrosion. Do not confuse brown or black stains on silver-plated contacts with corrosion. This stain is silver oxide and is a satisfactory conductor. Inspect for loose or dirty connections.

b. **CLEAN (C).** Wipe off all moisture with a clean, dry cloth. Clean the exterior surfaces of keys and switches with a stiff brush moistened with dry-cleaning solvent (SD) and polish the surface with a dry cloth. Clean the frames and springs of dirt and dust with a soft bristle brush. Do not use dry-cleaning solvent. Remove any corrosion from the key springs and frames with No. 0000 sandpaper, being careful not to damage or destroy the adjustment of the springs, and then wiping accessible surfaces with a clean, dry cloth or a soft bristle brush of a suitable size. If the contacts are corroded, pitted, or burned, resurface them with a burnishing tool. Flush the contacts with a clean toothpick and carbon tetrachloride. Dip the toothpick into the carbon tetrachloride to a depth of about $\frac{1}{2}$ inch and deposit the liquid on the contact without rubbing, holding the contacts slightly separated during this operation. Dip the flat end of another toothpick into the carbon tetrachloride and deposit it on the contact without rubbing to flush away the dirt that has been loosened by the first application. Be careful to keep the carbon tetrachloride away from the insulators. When the contacts are thoroughly dry, reburnish them so that no deposit or residue from the solution or any foreign material remains on the contacts. After burnishing, note whether the contact follow and separation requirements are still met since repeated burnishing tends to increase the contact separation and reduce the follow.

c. **ADJUST (A).** Adjust the spring tension of the key contacts with a suitable spring-bending tool. This adjustment and the contact gap and follow adjustment on the keys should be done by a qualified mechanic. Toggle-type switches cannot be adjusted. When trouble is found in this type switch, replace the defective switch with a new one.

38. Preventive Maintenance Tools and Materials

Note. Before starting preventive maintenance, have on hand all tools and materials needed in performing the

operations listed in the preventive maintenance check list. (See par. 39.)

a. MATERIALS. All the materials listed below may be secured through regular supply channels.

Signal Corps stock No.	Item
8A805	CHEESECLOTH: bleached; 36" wide.
6Z2000	CLOTH, emery; crocus; 9" x 11" sheets (spec No. 42C56-Navy).
6G184.1	CARBON TETRACHLORIDE.
6M750	PAPER, cleaning: Bell Seal bond; ¼" x 2½" sheets (WECo No. KS-7188).
6Z7500-000	PAPER, sand: flint; #0000; 9" x 11" sheets (Federal spec No. P-P-111).
	SOLVENT, Dry Cleaning (Federal spec No. P-S-661a).
6G1516	PASTE, metal: polish.

Note. Gasoline will not be used as a cleaning fluid for any purpose. Solvent, Dry Cleaning, is available as a cleaning fluid through established channels. Oil, Fuel, Diesel, may be used for cleaning purposes when dry-cleaning solvent (SD) is not on hand. Carbon tetrachloride will be used as a cleaning fluid only in the following cases: where inflammable solvents cannot be used because of fire hazard, and for cleaning electrical connections, plugs, commutators, etc.

b. TOOLS¹. All required tools are furnished with Tool Equipment TE-50 which is designed especially for maintenance of teletypewriter equipment. Tool Equipment TE-50 is available to personnel of organizations to which Distortion Test Set TS-383/GG is issued.

Ref. No.*	Signal Corps stock No.	Item
1	6Q17979	CASE CS-78.
2	6R9906	RULE: steel; 6".
3	4T2215	GAUGE: tape.
4	4T96368	GAUGE: set of assembly; wire; 0.006" to 0.025".
5	4T106163	GAUGE: set of cylindrical; wire; 0.030" to 0.060".
6	4T96395	GAUGE: set of assembly; wire; 0.065" to 0.080".
7	4T96355	GAUGE: set of assembly; flat; 0.002" to 0.010".
8	4T72581	PIN: gauge.
9	4T73517	GAUGE: perforation feed wheel.
10	4T73370	GAUGE: armature locating.
11	4T95368	SCREW DRIVER: hex.
12	6R17260	SCREW DRIVER: 2" blade; ⅝" tip; 4½" over-all.
13	6R15121	SCREW DRIVER: 1½" blade; ⅝" tip; 5½" over-all.
14	6R15310	SCREW DRIVER TL-21: 2½" blade; ⅝" tip; 6½" over-all.
15	6R19005-1	SCREW DRIVER: screw-holding; 10" blade; ⅝" tip; 13⅝" over-all.
16	6Q51014	HANDLE TL-14; file; wood; 4" over-all.

Ref. No.*	Signal Corps stock No.	Item
17	6Q60229	KNIFE TL-29.
18	4T138-55	SCALE: 8-oz.
19	4T138-58	SCALE: 32-oz.
20	4T4841	SCALE: 12-lb.
21	4T75765	HOOK: spring; pull.
22	4T75503	HOOK: spring; push.
23	4T77618	CASE: for small tools.
24	8A805	CHEESECLOTH: bleached; 36" wide.
25	4C9915.5/51	TOOL ROLL: empty.
26	6M751	PAPER: cleaning; Bell Seal bond.
27	6Z2000	CLOTH: emery; crocus; 9" x 11".
28	6Z7500-000	PAPER: sand; flint; #000; 9" x 11".
29	6Z2000-0	CLOTH: emery; #0; 9" x 11".
30	6M213	BRUSH: typewriter; toothbrush style.
31	6Z1567	BRUSH: sash tool; oval; No. 2.
32	6Z7360	ORANGE STICK: WECo No. KS-6320.
33	6Z7072	MIRROR: dental; WECo No. 376A; 6¾" x ¼" over-all.
34	4T6617	TOMMY.
35	4T102876	STONE: contact.
36	4T138-30	FILE: contact.
37	4T88993	BURNISHER: contact.
38	4T72003	BENDER: spring.
39	4T72574	TOOL: locking bail; finger holding.
40	4T72575	TOOL: finger bending.
41	4T87698	STONE: carborundum.
42	6G184.1	CARBON TETRACHLORIDE: 8-oz metal can; technical grade.
43	6N7531	SOLDER M-31: resin core.
44	6N8583	TAPE TL-83: friction; cotton; ¾" wide.
45	6N8692	TAPE TL-192: rubber; ¾" wide.
46	6R4513	PLIERS TL-13: sidecutting; 6".
47	6R4626	PLIERS TL-126: long chain-nose.
48	6R4735-6	PLIERS: duck-bill; 6".
49	6R4603	PLIERS TL-103: diagonal-cutting; 5".
50	6R55006	WRENCH TL-111; adjustable single end; ¾" capacity; 6" long.
51	4T87697	WRENCH: open; ½"-¾".
52	4T4838	WRENCH: open; ⅝"-1⅞".
53	4T95366	WRENCH: open; ⅝"-¾".
54	4T74871	WRENCH: open; 0.385".
55	4T95367	WRENCH: open; ¼"-⅝".
56	4T138-36	WRENCH: open; ⅝"-1¼".
57	6Q50004	HAMMER: riveting; 4-oz.
58	6Q17979/C2	CASE: for tuning fork.
59	4T104984	TUNING FORK 96.19 vps; Teletype No. 104984.
60	6Q17979/C2	CASE: for tuning fork.
61	4T103628	TUNING FORK: 87.6 vps; Teletype No. 103628.
62	6R24617	SOLDERING IRON TL-117: 110-v, 70-100-w; with cord and plug.
63	4T138-23	WRENCH: socket; ⅝".
64	4T138-22	SCREW DRIVER: hex.
65	4T89954	WRENCH: socket ¼".
66	4T89955	WRENCH: socket; ⅝".
67	6Z7306	OILER: 6 oz; ½" x 4¼" spout; 1 drop force feed control.
68	6G800	GUN: grease; Teletype No. 88975.
69	6Z6970	MAGNET M-129: bar; steel; 6" x ¾" x ¼".
70	6Q38124-6	FILE: half-round; smooth; 6".
71	6Q38033-6	FILE: flat; second cut; 6".
72	6R57400-5	WRENCH: socket; Bristol; for No. 5 fluted setscrews.
73	6Z4002	FLASHLIGHT TL-122: includes bulb.
74	3F4470-236	TEST UNIT I-236: 5½" x 3¾" x 3¼"; includes neon lamp and target lamp.

*Reference numbers refer to figure 7.

¹ This list was compiled on 1 August 1945 and is based on Signal Supply Catalog SIG 6-TE-50, April 1945.

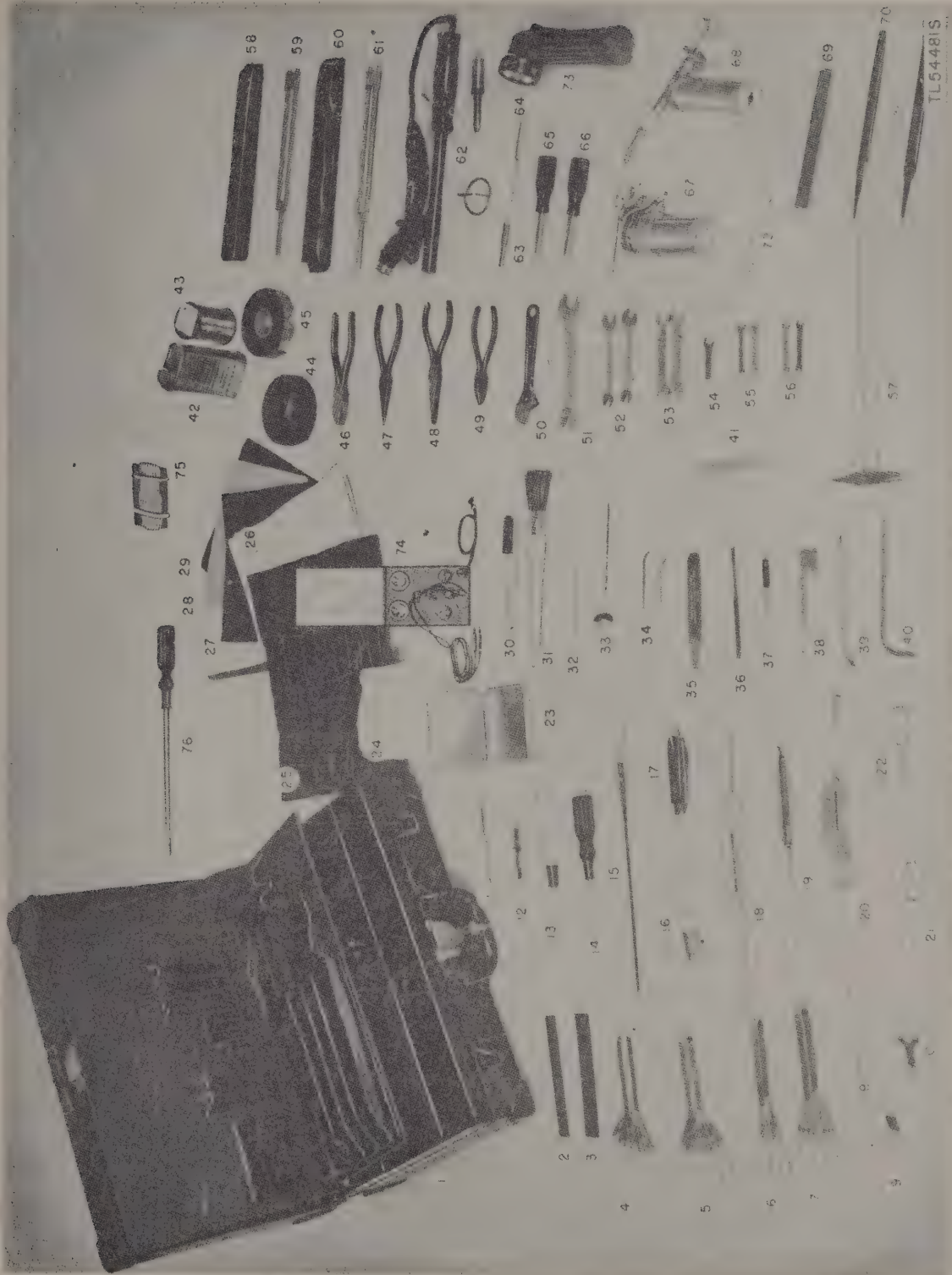


Figure 7. Tool equipment TH-50.

Section. VIII. PREVENTIVE MAINTENANCE CHECK LIST

39. Preventive Maintenance Check List for Distortion Test Set TS-383/GG

The following check list is a summary of the preventive maintenance to be performed on Distortion Test Set TS-383/GG. The time intervals shown on the check list are based on normal daily use. Under special conditions, the intervals may be changed by the local commander. For best performance of the equipment, however, the operations must be performed at least as often as called for in the check list. The echelon column indicates that all operations are to be completed by second or higher echelon teletypewriter mechanics. Operations are indicated by the word FITCAL. For example, if the letters FITA appear in the Operations column, the item to be treated must be felt (F), inspected (I), tightened (T), and adjusted (A).

Item No.	Operations	Item	When performed				Echelon	
			Daily	Weekly	Monthly	Semi-annually		
1	ITCA	Exterior of test set. (See par. 26.)	x				2d	
2	ITC	Cords and plugs. (See par. 27.)		x			2d	
3	ITCAL	Gears and shafts. (See par. 28.)		x			2d	
4	ICAL	Code disk assembly. (See par. 29.)		x			2d	
5	ITCAL	Code selecting cylinder and transmitting contact assembly. (See par. 30.)		x			2d	
6	ICAL	Transmitting contact bail and extension. (See par. 31.)		x			2d	
7	FITCAL	Motor. (See par. 32.)			x		2d	
8	IC	Capacitors and resistors. (See par. 33.)			x		2d	
9	ITC	Terminal blocks. (See par. 34.)			x		2d	
10	ITC	Wiring. (See par. 35.)			x		2d	
11	ICA	Distributor assembly. (See par. 36.)			x		2d	
12	ICA	Keys and switches. (See par. 37.)				x	2d	
			F	I	T	C	A	L
			FEEL	INSPECT	TIGHTEN	CLEAN	ADJUST	LUBRICATE

Section IX. LUBRICATION

40. Approved Lubricants and Cleaners for Distortion Test Set TS-383/GG

The following table lists the lubricating and cleaning materials necessary for servicing Distortion Test Set TS-383/GG.

Symbol	Standard nomenclature
GL	Grease, lubricating, special.
PS*	Oil, lubricating, preservative, special.
OE*	Oil, engine.
SD	Solvent, dry-cleaning.

*When the temperature is so high that special preservative lubricating oil (PS) runs off the parts, engine oil (OE) may be used in place of oil (PS).

41. Detailed Lubrication Instructions

a. GENERAL. The lubrication instructions listed are based on normal operating conditions with the equipment in service for an average of 8 hours a day. Under these conditions, the lubrication interval is once every month. When the equipment is operated more than 8 hours a day, reduce the interval proportionally. When equipment is operated in tropical climates, a further reduction in the interval may be required. The location of the parts of Distortion Test Set TS-383/GG are shown in figure 8. The type of lubricant to be used and the specific instructions for each part are given in the lubrication chart. (See *c* below.) Apply PS sparingly to springs and loops of all helical springs to prevent wear and rust. When the unit is overhauled or repairs made, clean the parts with dry-cleaning solvent (SD), allow the equipment to dry, and relubricate.

CAUTION: Do not lubricate the equipment

with the motor running. Do not apply lubricants in excess of the quantities recommended. Wipe off excess oil and grease.

b. METHOD OF APPLYING GREASE. (1) *Filling grease gun.* Fill the grease gun furnished as part of Tool Equipment TE-50 in the following manner:

(a) Unscrew the lubricant tube from the cap casting.

(b) Place the open end of the lubricant tube over the opening in the filling washer in the can of proper lubricant. Press down on the lubricant tube until the tube is filled.

Note. If the cans of lubricant on hand are not equipped

with filling washers, press the metal follower against the back end of the lubricant tube and fill the tube by using a clean wooden paddle or the fingers. Tamp the lubricant down solidly in the tube by pounding the closed end sharply against the palm of the hand. Continue to add lubricant and tamp until the tube is completely filled.

(c) Screw the lubricant tube back into the cap casting just enough to hold the tube in place. Insert a rod, screw driver, pencil, or similar object through the perforated end of the lubricant tube and press the metal follower into the tube to expel any air that may be trapped in the tube. When the lubricant begins to ooze past the threads, screw the lubricant tube securely into the cap casting.

(d) Operate the handle back and forth several times until lubricant is pumped from the nozzle. The grease gun is then ready for use. If the lubricant does not flow from the nozzle in a solid stream when the handle is operated, all the air has not been expelled from the tube. Invert the gun and pound the cap casting end against the palm of the hand to jar the lubricant into the pump cylinder.

(2) *Greasing pressure fittings.* To grease parts that are equipped with pressure fittings, place the nozzle of the grease gun squarely against the grease fittings and operate the handle.

CAUTION: Test the grease gun *before* greasing pressure fittings to determine how much grease is injected for each full operation of the handle. *Do not overlubricate the equipment.*

(3) *Greasing flat surfaces.* To grease flat surfaces, hold the nozzle of the grease gun against the surface, tilted at an angle of approximately 45°. Operate the handle until sufficient grease is ejected. If the surface is long, operate the handle slowly and at the same time move the nozzle of the gun along the surface to form a continuous ribbon of lubricant. Pump the lubricant out onto the fingers or the end of a screw driver for transfer to hard-

to-reach places that cannot be reached directly with the grease gun.

c. METHODS OF APPLYING OIL. (1) *Filling oiler.* Fill the oiler furnished as part of Tool Equipment TE-50 by unscrewing the top and removing the pump. Fill the tube with the proper lubricant and replace the pump. Replace the top and tighten it securely.

(2) *Use of oiler.* After filling the oiler or when starting to use the oiler after it has been standing for some time, operate the pump handle until oil is forced out of the nozzle. Then adjust the stop beneath the pump handle for the desired flow of oil. Turn the adjusting screw in a counterclockwise direction to increase the flow of oil.

Note. Move the adjustable stop beneath the pump handle to one side to make the stop inoperative.

(3) *Applying oil with wire.* An approved method of applying 1 to 2 drops of oil is to dip a piece of B&S No. 22-gauge wire ½ inch into the oil and immediately touch the wire to the lubrication point. This method avoids overlubrication.

d. PREPARATION FOR LUBRICATION. Remove the rear cover of the test set and the face plate disk. The rear cover is held by three screws near the base, one on each side and one in the back. Remove the screws and lift off the cover. The face plate disk is fastened to the hub by three screws. Remove the screws and the disk. Loosen the lamp arm mounting screws and move the lamp arm and bracket toward the center of the hub to clear the edge of the distortion measuring scale. Remove the screw holding the hub on the shaft and remove the hub assembly. Remove the four retaining plate screws and the plate exposing the front main shaft ball bearing.

CAUTION: Do not lubricate the segmented distributor rings or the solid distributor rings. Do not lubricate the contacts.

e. LUBRICATION CHART.

Item No.*	Name of part	Lubricant	Method and quantity
1	Code disk cams.....	GL	Apply thin film around outer curved surfaces.
2	Code disk oil wick.....	PS	Saturate.
3	Code disk shaft bearings.....	PS	One or two drops to bearings at each end.
4	Code disk shaft gear.....	GL	Apply thin film to gear teeth.
5	Code selecting cylinder.....	PS	One drop to bearings at each end.
6	Code selecting cylinder camming surfaces.....	GL	Apply thin film around outer curved surfaces.
7	Contact levers (five or six).....	PS	One drop to bearings and at each shield spring.
8	Contact lever bail shaft.....	PS	One or two drops to bearing at each end.
9	Distortion adjusting gear bearings.....	PS	One to two drops to each bearing.
10	Distortion adjusting gears.....	GL	Apply thin film to gear teeth.
11	Friction washers.....	PS	Saturate.
12	Intermediate gears.....	GL	Apply thin film to gear teeth.

Item No.*	Name of part	Lubricant	Method and quantity
13	Intermediate shaft.....	PS	Three or four drops in end of intermediate shaft.
14	Main shaft ball bearings.....	GL	Knead lubricant into space between inner and outer bearing races. Wipe off excessive lubricant.
15	Main shaft gears.....	GL	Apply thin film to gear teeth.
16	Motor bearing oilers.....	GL	One or two strokes of grease gun plunger to each oiler. Wipe off excessive lubricant.
17	Motor pinion.....	GL	Apply thin film to pinion teeth.
18	RUN-STOP switch shaft bearing.....	PS	One or two drops to oiler in bearing.
19	Stop contact lever bearing.....	PS	One drop to lever bearing.
20	Stop contact lever latch bearing.....	PS	One drop to lever latch bearing.
21	Stop contact lever latch cam.....	GL	Apply thin film around outer curved surface.
22	Reverse rotation stop pulley.....	GL	Grease groove sparingly.
23	Reverse rotation stop wedge bearing.....	PS	One drop to wedge bearing.

*Item number refers to figure 8.

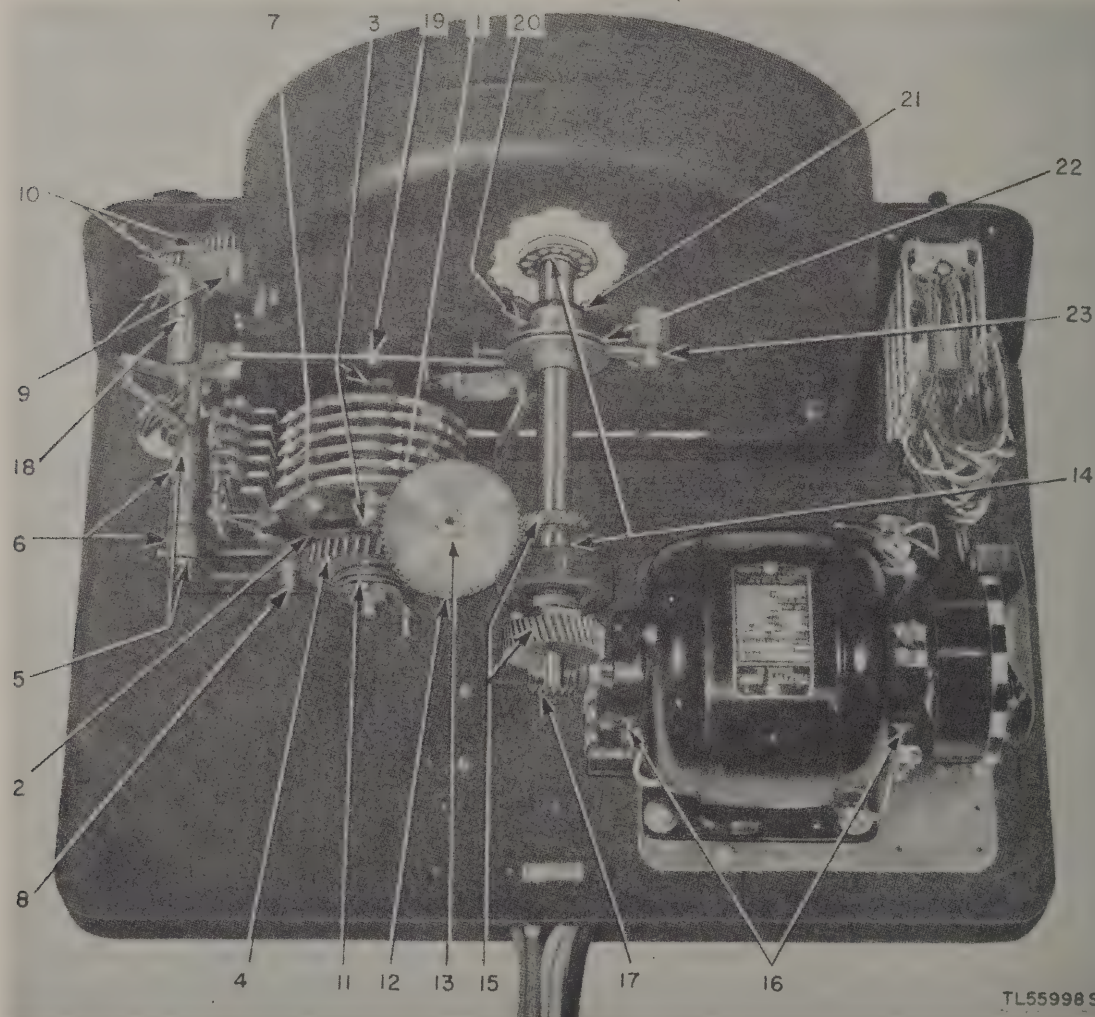


Figure 8. Distortion Test Set TS-383/GG showing lubrication points.

Section X. MOISTUREPROOFING AND FUNGIPROOFING

42. General

a. When equipment is operated in highly humid climates, excessive failure of parts and decreased operating efficiency are usually caused by the accumulated effects of moisture rather than by inferior parts. Rapid temperature changes accompanied by fog, rain, dew, or high humidity promote such failures.

b. The effects of moisture on resistors, capacitors, coils, terminal blocks, and insulating strips can be recognized in the form of corrosion, low insulation resistance, and flash-overs. Moisture also accelerates fungus growth which increases these effects.

43. Reducing Failures

a. A moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. The treatment consists of applying a film of moisture- and fungi-resistant varnish to all susceptible parts of the equipment. This film provides a nonwetting surface. Equipments which have been treated have been marked with the letters MFP and the date of treatment. Equipment not marked should be examined and, if treatment has not been applied, the equipment should be returned to third or higher echelon maintenance units for treatment.

b. TB SIG 13 contains a detailed description of this treatment.

c. Re-treatment may be required after a period of use. Need for this re-treatment is indicated by excessive failures or by the effects listed in paragraph 42.

44. Treating Distortion Test Set TS-383/GG

To treat Distortion Test Set TS-383/GG, use the procedure outlined in TB SIG 13 together with the following information:

- a.* Mask all code disk contacts.
- b.* Mask all key contacts.
- c.* Mask motor terminal block slip contacts.
- d.* Mask all gears.
- e.* Mask edges of code disks.
- f.* Mask stop contact assembly and contacts.
- g.* Mask code cylinder.
- h.* Mask all bearing surfaces.
- i.* Mask governor contact brush and contact disk.
- j.* Do not treat motor.

45. Treating Equipment After Repairs

If the coating of protective varnish has been punctured or broken during repair and if complete treatment is not needed to reseal the equipment, brush-coat the affected part. Be sure the break is completely sealed.

PART FOUR
AUXILIARY EQUIPMENT

(Not used)

PART FIVE

REPAIR INSTRUCTIONS

Note. Failure or unsatisfactory performance of equipment used by Army Ground Forces and Technical Services will be reported on WD AGO Form 468 (Unsatisfactory Equipment Report); by Army Air Forces, on AAF Form 54 (Unsatisfactory Report). If AAF Form 54 is not available, prepare the data according to the form shown in B, figure 9.

Section XI. GENERAL REPAIR PROCEDURE

46. Repair Techniques

a. GENERAL. It is necessary to have a complete knowledge of the construction and operation of the various parts and circuits of the equipment to decide when to make repairs or turn the equipment in for replacement. Service failures can be kept to a minimum by careful handling of equipment and by completion of preventive maintenance procedures specified in part three. When service faults are discovered, follow a definite plan of corrective maintenance in order to reduce both the time the equipment is in trouble and the time required to complete repairs.

b. TROUBLE LOCATION. Paragraph 56 describes the isolation of troubles by the elimination process.

c. TROUBLE CORRECTION. Complete the repair, adjustment, and replacement of parts and units in accordance with instructions given in the paragraphs of sections XIV and XV pertaining to the apparatus involved.

47. Unsatisfactory Equipment Reports

a. When trouble in equipment used by Army Ground Forces or Technical Services occurs more often than repair personnel feel is normal, WD AGO Form 468, should be filled out and forwarded through channels to the Office of the Chief Signal Officer, Washington 25, D. C.

b. When trouble in equipment used by Army Air Forces occurs more often than repair personnel feel is normal, AAF Form 54, should be filled out and forwarded to the Commanding General, Air Matériel Command, Wright Field, Dayton, Ohio, in accordance with AAF Regulation 15-54. If form is not available, prepare the data according to the sample form shown in B, figure 9.

Section XII. DETAILED FUNCTIONING OF EQUIPMENT

48. Introduction to Detailed Functioning

This section explains in detail the mechanical functioning of the various parts, assemblies, and circuits of Distortion Test Set TS-383/GG. It also explains the over-all theory of operation and describes the individual elements which are combined to perform the various functions of the equipment. Each of the main assemblies and functions are discussed in a separate paragraph. Appropriate illustrations are included to clarify the relation to other parts or assemblies.

49. Distributor

a. The distributor face is equipped with six concentric rings. The two outer rings are segmented, and the outer (movable) segmented ring may be oriented with respect to the inner (stationary) segmented ring. The position or setting of the outer segmented ring determines the amount of distortion transmitted. The four inner rings are solid conductors. The outer pair are used with the segmented rings in the transmitting circuits. The inner pair of solid rings are used for the neon distortion indicator lamp. An over-all view of the distributor is shown in figure 10.

b. The distributor completes electrical connections between the transmitting contacts and the signal line in the correct sequence and at the required speed by the use of three pairs of brushes. The brushes are drawn in a clockwise direction over the six commutator disks by a distributor brush arm which is attached, through the hub on which it is mounted, to the main distributor shaft. The brushes making contact with the outer (movable) segmented ring and the inner solid ring of the transmitted circuit are wired together. When undistorted signals are transmitted these brushes are the only ones involved. The brushes making contact with the inner segmented ring and the outer solid ring of the transmitting circuit are also wired together. Both sets of brushes and rings are used to transmit distorted signals by connect-

WAR DEPARTMENT UNSATISFACTORY EQUIPMENT REPORT					
FOR	TECHNICAL SERVICE Signal Corps	MATERIAL	DATE 10 Jan 45		
FROM	ORGANIZATION 761 Signal Repair Co	STATION San Francisco 9		TECHNICAL SERVICE	
TO	NEXT SUPERIOR HEADQUARTERS Signal Officer, Blue Army	STATION San Francisco 9			
COMPLETE MAJOR ITEM					
NOMENCLATURE Teletypewriter TG-O-B		TYPE		MODEL	
MANUFACTURER Teletypewriter Co	U. S. A. DES. NO. 1234-Phila-44	SERIAL NO. 5678	DATE RECEIVED 12 Aug 44		
EQUIPMENT WITH WHICH USED (If applicable)					
DEFECTIVE COMPONENT—DESCRIPTION AND CAUSE OF TROUBLE					
PART NO. 4T74354	TYPE Ribbon reverse arm	MANUFACTURER Teletypewriter Co	DATE INSTALLED 8 Sep 44		
DESCRIPTION OF FAILURE AND PROBABLE CAUSE (If additional space is required, use back of form) Ribbon fails to reverse					
DATE OF INITIAL TROUBLE 12 Dec 44	TOTAL TIME INSTALLED		TOTAL PERIOD OF OPERATION BEFORE FAILURE		
	YEARS 0	MONTHS 3	DAYS 4	YEARS 0	MONTHS 3
				DAYS 4	HOURS -
					MILES -
					ROUNDS -
BRIEF DESCRIPTION OF UNUSUAL SERVICE CONDITIONS AND ANY REMEDIAL ACTION TAKEN Operating in tropics an average of 20 hours daily during this period. Tightened setscrew 9 different times.					
TRAINING OR SKILL OF USING PERSONNEL		RECOMMENDATIONS (If additional space is required, use back of form)			
POOR	FAIR	GOOD	X Improve design of ribbon reverse arm and shaft.		
TYPED NAME, GRADE, AND ORGANIZATION W. R. Reed, 2d Lt Sig C 761 Signal Repair Co		SIGNATURE W.R. Reed			
FIRST ENDORSEMENT					
TO CHIEF	TECHNICAL SERVICE	OFFICE			
NAME, GRADE, AND STATION		STATION		DATE	
Instructions					
<ol style="list-style-type: none"> It is imperative that the chief of technical service concerned be advised at the earliest practical moment of any constructional, design, or operational defect in material. This form is designed to facilitate such reports and to provide a uniform method of submitting the required data. This form will be used for reporting manufacturing, design, or operational defects in material, petroleum fuels, lubricants, and preserving materials with a view to improving and correcting such defects, and for use in recommending modifications of material. This form will not be used for reporting failures, isolated material defects or malfunctions of material resulting from fire wear and tear or accidental damage nor for the replacement, repair or the issue of parts and equipment. It does not replace currently authorized operating or performance records. Reports of malfunctions and accidents involving ammunition will continue to be submitted in the manner described in AR 780-10 (change No. 3). It will not be practicable or desirable in all cases to fill all blank spaces of the report. However, the report should be as complete as possible in order to expedite necessary corrective action. Additional pertinent information not provided for in the blank spaces should be submitted as footnotes to the form. Photographs, sketches, or other illustrative material are highly desirable. When cases arise where it is necessary to communicate with a chief of service in order to secure safety to personnel, more expeditious means of communication are authorized. This form should be used to confirm reports made by more expeditious means. This form will be made out in triplicate by using or service organization. Two copies will be forwarded direct to the technical service, one copy will be forwarded through command channels. Necessity for using this form will be determined by the nature of the service reports. 					

W. D. A. G. O. Form No. 488
2d August 1944

This form supersedes W. D. A. G. O. Form No. 488, 1 December 1944, which may be used until existing stocks are exhausted.

G. S. REPORTING SYSTEM, REV. 1944 (10-41344-1)

A

Figure 9. Unsatisfactory equipment reports with sample entries.

WAR DEPARTMENT
A.A.F. Form No. 64
(Revised 2-15-43)

WAR DEPARTMENT ARMY AIR FORCES

UNSATISFACTORY REPORT

(See AAF Reg. 15-64 for information on Proper Use of this Form)

LEAVE BLANK

A. E. C. SERIAL NO.	REFER TO	CLASS
---------------------	----------	-------

TO BE FILLED IN BY STATION

STATION SERIAL NO.	DATE SUBMITTED
45-1	27 Mar 45

STATION APO 528, c/o PM, New York	ORGANIZATION 58TH AACGS Grp. 116th AACGS Sq.
--------------------------------------	---

SUBJECT OF REPORT Property Class—Name Reperforator Transmitter TG-26-A	Manufacturer Teletype Corp.	AAF Division or Shipyard No.
--	--------------------------------	------------------------------

AIRCRAFT—Model & AAF Serial No.	ENGINE—Model & AAF Serial No.	UNIT OR ACCESSORY—Type, Model and Serial No.
---------------------------------	-------------------------------	--

AIRCRAFT REPORTS ONLY LAST B. L. R.—Report	Date	Flying Time Since	Total Flying Time
---	------	-------------------	-------------------

ENGINE REPORTS ONLY LAST OVERHAUL—Report	Hours Since	Depots and Hours At Each Previous Overhaul
---	-------------	--

Name Spring Retainer of Punch Block Assembly	Part Drawing, Serial and Specification No. 4T102791
---	--

Time in Use 14 days	Quantity on Hand 1	Quantity Known Defective 1	No. Previous Failures 3	Manufacturer Teletype Corp.	Inspector's No. or Identification
------------------------	-----------------------	-------------------------------	----------------------------	--------------------------------	-----------------------------------

Indicate by "X" Reasons of Failure	Photographed and Prints Enclosed	Held for Instructions	Sent Under Separate Cover	Sent in Allocated Package	Repaired and Returned to Service	Discarded of (Explain Reason.)	To Overhaul Facility (INITIALS)
---------------------------------------	----------------------------------	-----------------------	---------------------------	---------------------------	----------------------------------	--------------------------------	---------------------------------

GIVE COMPLETE DETAILS, PROBABLE CAUSES AND RECOMMENDATIONS BELOW:

(Use Only Applicable Spaces Above—Avoid Unnecessary Repetition)

EXPEDITE

- DESCRIPTION OF UNSATISFACTORY CONDITION: The Spring Retainer is part of the punch block assembly of the U.S. Army Signal Corps TG-26-A. Shortly after these teletypewriters were installed, the spring retainer in three of the machines snapped at the end section. Two were rewelded and put back in service due to lack of spares. The third was too badly broken to repair.
- PROBABLE CAUSES: Evidently too much strain is put on the arm section of this part especially the farther arm which is considerably smaller in width and thickness.
- RECOMMENDATIONS: The spring retainer should be made of non-cast or a heavier metal. Spares should be provided with each set.

William Blank
WILLIAM BLANK
Capt, Air Corps
Communications Officer

ROUTING

SEND ORIGINAL AND TWO COPIES DIRECT TO COMMANDING GENERAL,
HQ. AIR SERVICE COMMAND, PATTERSON FIELD, FAIRFIELD, CALIF.

U. S. GOVERNMENT PRINTING OFFICE : 1943 10-34610-1

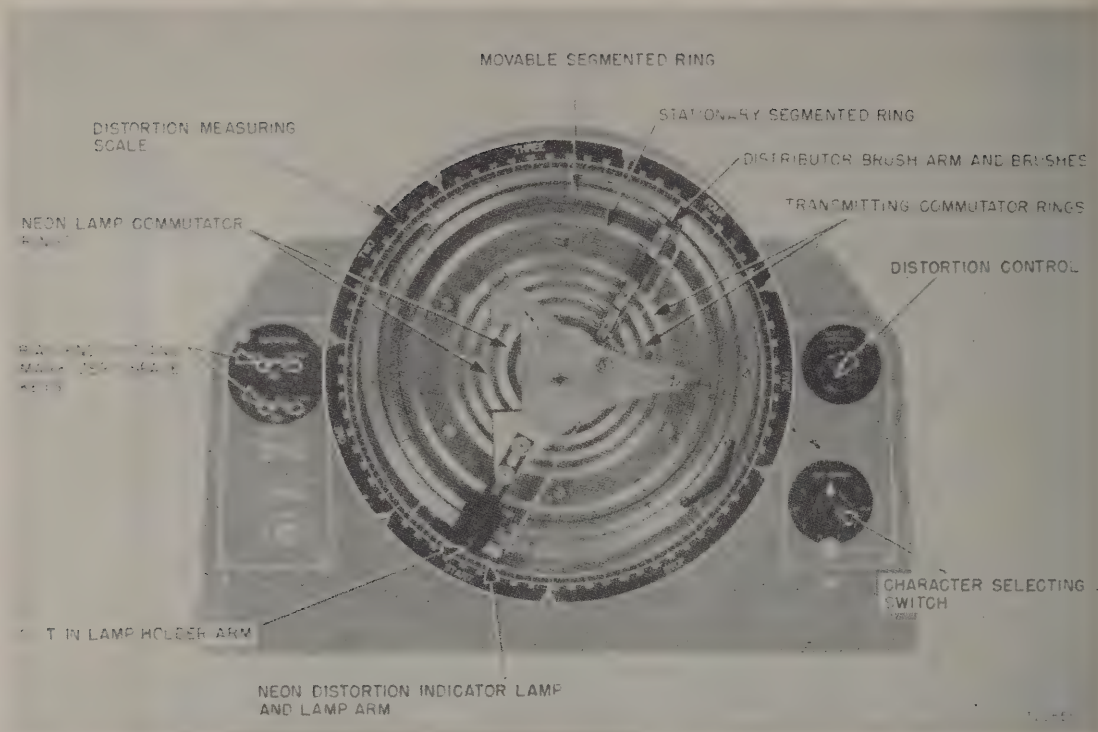


Figure 10. Distortion Test Set TS-383/GG, Distributor and brush arm assembly.

ing electrically the corresponding segments of the movable ring and the stationary ring, either in series or in parallel. The two brushes making contact with the inner pair of solid rings are wired to the neon lamp. This set of brushes and rings are used only when signals received by the test set are connected to the stroboscope input to be measured on the graduated distortion measuring scale.

c. The neon lamp is mounted on the hub opposite the distributor brush arm. (See fig. 10.) When incoming signals are being measured, the light from the lamp is viewed through a slit in the lamp holder arm. A cut-out in the face plate disk lines up with the lamp holder arm. The distortion measuring scale lines up with the cut-out in the face plate. As the neon lamp revolves with the distributor brush arm, it is lighted during marking impulses and the impulse lengths may be measured on the scale.

d. The segmented distributor rings and the solid transmitting pair of distributor rings are electrically connected through the transmitting contacts associated with the code disk transmitter (fig. 11) and the character selecting switch to the

signal line. Thus signals can be transmitted at the correct speed and sequence to the equipment under test.

e. The segmented rings correspond to the impulses of the teletypewriter character cycle, that is, a *start* segment, five *code* segments, and a *stop* segment. The distributor brush makes one complete revolution to transmit the code combination for each character or function. When a brush passes over a start segment, a *spacing* impulse is always transmitted. When a brush passes over a stop segment, a *marking* impulse is always transmitted. These two impulses keep the distributor and the teletypewriter equipment in step or synchronism by controlling the starting and stopping of the teletypewriter mechanism. When signals are being transmitted by the test set, the code combination is determined by the setting of the character selecting switch. (See par. 51h.)

f. Distortion is introduced into the signal by positioning the segments on the outer movable segmented ring in series or in parallel with the corresponding segments of the inner stationary segmented ring before completion of the electrical

path to the signal line. These segments are placed in series or in parallel by the settings of the BIAS-END DIST and MARK-ZERO-SPACE keys. The degree of distortion is controlled by adjusting the distortion control (par. 51f) until the desired amount of distortion is measured on the distortion measuring scale.

g. The main distributor shaft is mounted horizontally in the test set. A gear mounted at the end of the main shaft couples the distributor to the pinion of the drive motor. (See fig. 11.)

50. Code Disk Transmitter

a. The code disk transmitter, which sets up combinations for transmitting test messages, con-

sists principally of code disk cams, contact levers, and contacts. The code disk cams actuate the contact levers which, in turn, operate the proper contacts.

- b. The contact lever assembly consists of a metal bracket on which are mounted the contact levers, the code selecting cylinder, and the five transmitting contacts. Each transmitting contact consists of two pairs of contacts which are operated simultaneously. The outer (farthest from code disks) long contacts are connected to the movable segmented distributor ring, and the inner (nearest code disks) short contacts are connected to the stationary segmented distributor ring. The inner short contacts are connected at a common point

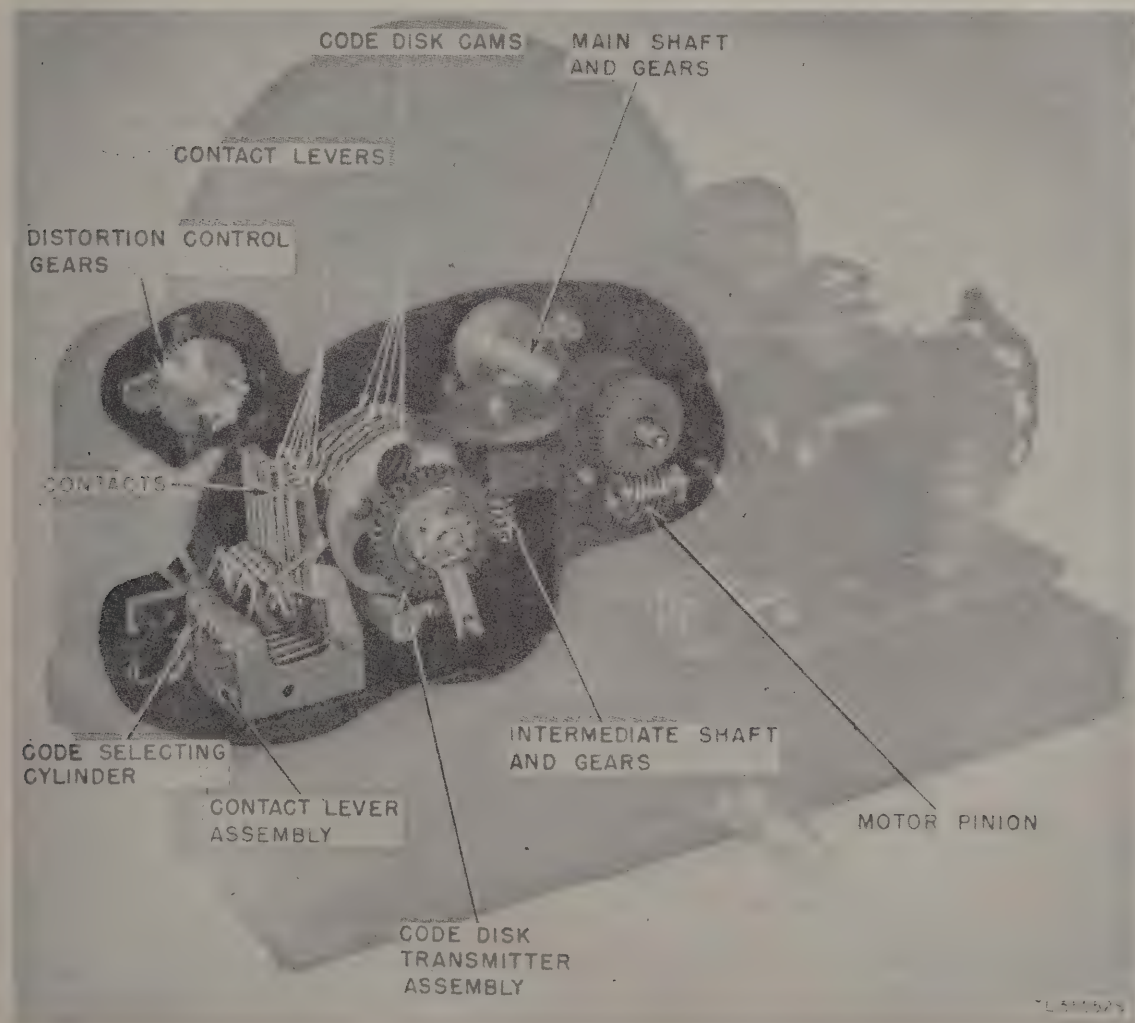


Figure 11. Distortion Test Set TS-383/GG, code disk transmitter assembly.

to the BIAS-END DIST key. The inner long contacts are connected at a common point to the MARK-ZERO-SPACE key. The character selecting switch operates the code selecting cylinder which positions the transmitting contacts so that the proper electrical circuit is set up for the transmission of the selected signal. During the transmission of repeated single code combinations of R, Y, T, O, M, V, LET (letters), and BLK (blank), the transmitting contacts are cammed away from the code disks so that they are not operated for transmission of the test message. (See par. 51h.) When a pair of contacts is made a continuous path exists from the contacts to the character selecting switch and a marking impulse is transmitted. When a pair of contacts is broken, the circuit is open and a spacing impulse is transmitted.

c. The code disk assembly consists of five disks with cams of various lengths spaced around the outer rims. The code disk assembly is driven through a series of gears from the main distributor shaft and rotates with a fixed relationship to the rotation of the distributor brush arm. A friction assembly, located at the rear of the code disk assembly shaft, applies a drag on the shaft and prevents backlash. The five contact levers have pointed arms which press against the coded disks. As a contact lever rides into a low position of a disk, it is forced to pivot about the contact lever bearing shaft, forcing the contacts together and thus transmitting a mark. When the contact lever rides up on a raised cam, the contact lever pivots back, the contacts separate, and a space impulse is transmitted. The code disks are so arranged that at any one position the five contact levers hold the contacts in position to transmit marking or spacing impulses in the correct sequence to form a complete character or function in accordance with the teletypewriter five-unit start-stop code. One complete revolution of the code disks transmits the test message THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS (code signal) SENDING, followed by two line feed and one carriage return combinations.

d. The electrical circuit from the distributor through the transmitting contacts is completed by setting the character selecting switch to the TEST MESSAGE position. When the character selecting switch is in any other position, the transmitting contacts are cammed away from the code disks and

the test message is not transmitted to the signal line.

51. Control Mechanisms

a. BIAS-END DIST KEY. THE BIAS-END DIST (distortion) key is used for selecting the type of distortion to be transmitted. With the key in the BIAS position, all *space-to-mark* transitions are advanced or retarded with respect to the beginning of the start pulse of a teletypewriter character. In the END DIST position, all *mark-to-space* transitions are advanced or retarded in respect to the start pulse.

b. MARK-ZERO-SPACE KEY. Used in conjunction with the BIAS-END DIST key (a above), the MARK-ZERO-SPACE key is used for selecting the type of transmission desired. With the key on MARK or SPACE, marking or spacing bias or marking or spacing end distortion may be transmitted. When ZERO distortion is to be transmitted, the BIAS-END DIST key should be left in its neutral position.

c. VIEW-TRANSMIT KEY. In the VIEW position, the VIEW-TRANSMIT key connects the transmitting rings to the stroboscope so that the amount of distortion desired may be adjusted before transmitting distorted signals to the equipment under test. When this key is in the VIEW position, the RUN-STOP switch (g below) should be at STOP. With the VIEW-TRANSMIT key at TRANSMIT, dc to the stroboscope is cut off and no signals can be viewed.

d. LINE-DIST KEY. The LINE-DIST (distributor) key is for connecting the neon lamp for local calibration with the key in the DIST position, or for connecting the lamp to an external line for checking incoming signals with the key on LINE. When the key is in its neutral position no signals can be viewed on the stroboscope.

e. MOTOR ON-OFF TOGGLE SWITCH. This is a double-pole double-throw toggle switch for starting and stopping operation of the test set.

f. DISTORTION CONTROL. The distortion control, designated INCREASE DISTORTION, is for adjusting the amount of distortion to be transmitted. It is geared to the movable segmented distributor ring and changes the alignment of this ring in relation to the stationary segmented ring so that the desired amount of distortion may be transmitted to the equipment under test. The amount of distortion is measured on the distortion measuring scale.

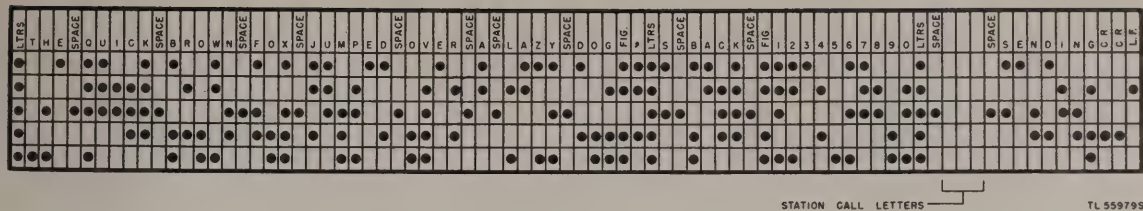


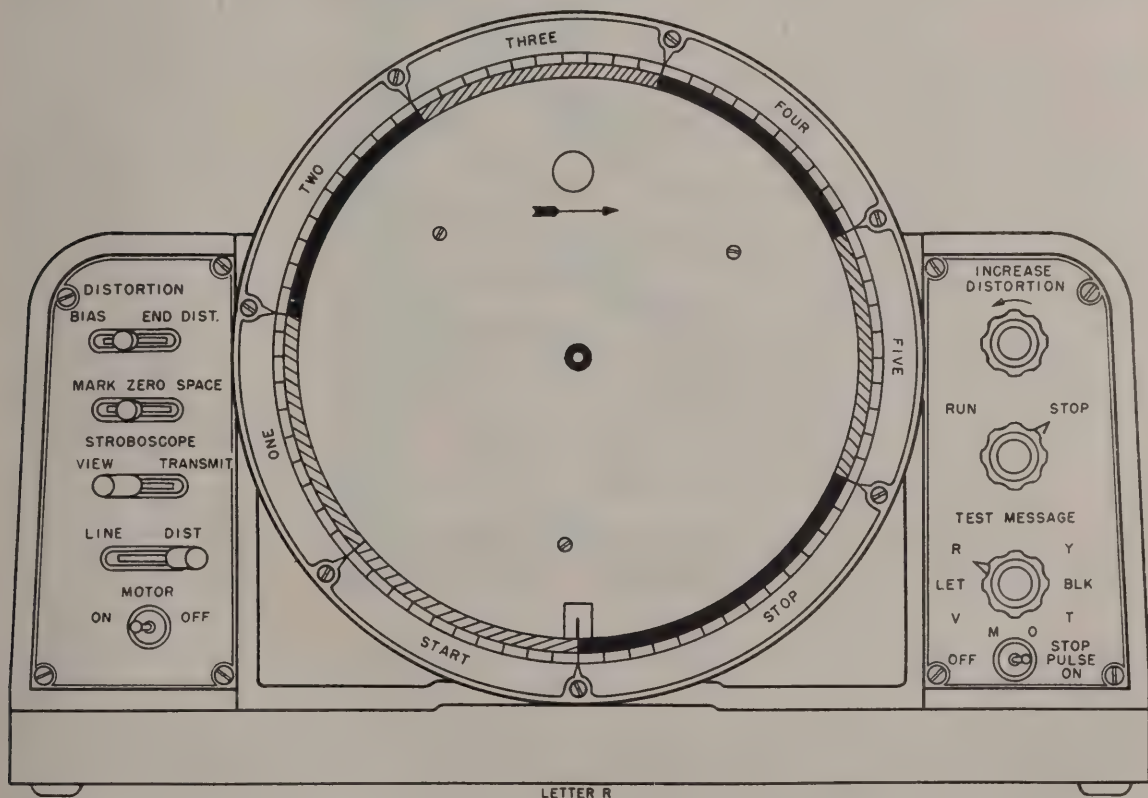
Figure 12. Tape perforations for test message.

g. RUN-STOP SWITCH. The RUN-STOP switch is a two-position control. In the STOP position the outgoing line is short-circuited to keep the line closed when adjusting distortion. With the switch in the RUN position, the short-circuit is removed and signals with the desired amount of distortion are transmitted to the equipment under test.

h. CHARACTER SELECTING SWITCH. The character selecting switch is a multi-position switching cam used for selecting the signals to be transmitted: R, Y, T, O, M, V, LET (letters), BLK (blank),

or the test message, THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK 1234567890 DTS SENDING.

(1) In the TEST MESSAGE position the switch connects the distributor, through the code disk transmitter and the transmitting contacts, to the signal line. With the switch in any other position, the transmitting contacts are cammed away from the code disk and a continuous selected function is permitted to be transmitted by closing one or more of the transmitting contacts as required to transmit a marking impulse in the sequence



CODE:
 MARKING IMPULSE (TWO AND FOUR)
 SPACING IMPULSE (ONE, THREE AND FIVE)

TL55975S

Figure 13. Diagrammatic representation of marking impulses for letter R.



PLATEN POSITION

LINE SIGNALS

	LTRS		FIGS		START	IMPULSES					STOP
	ALL MACHINES	COMMUNICATION MACHINES	WEATHER MACHINES			1	2	3	4	5	
A	—	↑	⊕								
B	?	⊕	⊕								
C	:	⊕	⊕								
D	\$	↗	↗								
E	3	3	3								
F	!	→	→								
G	&	↘	↘								
H	STOP	↓	↓								
I	8	8	8								
J	'	↖	↖								
K	(←	←								
L)	↖	↖								
M	.	.	.								
N	,	⊕	⊕								
O	9	9	9								
P	0	0	0								
Q	1	1	1								
R	4	4	4								
S	BELL										
T	5	5	5								
U	7	7	7								
V	;	⊕	⊕								
W	2	2	2								
X	/	/	/								
Y	6	6	6								
Z	"	+	+								
BLANK	—	—	—								
CARRIAGE RETURN											
LINE FEED											
SPACE											
LETTERS SHIFT											
FIGURES SHIFT											

SIGNAL LENGTHS IN MILLISECONDS. STANDARD SPEED 60 WORDS PER MIN

—22—+22—+22—+22—+22—+22—+31—

 SPACING IMPULSES
 MARKING IMPULSES

 REPEATED SIGNALS SENT BY DISTORTION
 TEST SET TS-383/GG

TL 9177B

Figure 1j. Marking impulses of teletypewriter five-unit stop-start code.

determined by the teletypewriter five-unit start-stop code. (See fig 14.)

(2) With the switch in the R position, segments 2, 4, and the STOP segment are connected to the signal line. (See fig. 13).

(3) With the switch on Y, segments 1, 3, 5, and the STOP segment are used.

(4) With the switch on T, segment 5 and the STOP segment are connected to the line. This position is used in combination with the STOP PULSE switch (*i* below) with the stop impulse OFF when a single marking impulse is to be transmitted.

(5) With the switch in position O, segments 4, 5, and the STOP segment are connected to the signal line.

(6) With the switch in position M, segments 3, 4, and 5 and the STOP segment are connected to the line.

(7) With the switch on V, segments 2, 3, 4, 5, and STOP are connected to the line.

(8) With the switch on LET, segments 1, 2, 3, 4, 5, and STOP are connected to the line.

(9) With the switch on BLK, the STOP segment is the only segment connected to the signal line.

i. STOP PULSE ON-OFF SWITCH. The STOP PULSE switch is a double-pole double-throw toggle switch used for disconnecting the stop impulse. This permits transmitting a single continuous marking impulse of code length when the switch is turned OFF by setting the character selecting switch to T. (See *h*(4) above.)

52. Motor Unit

The 1/25-hp motor is mounted on the motor mounting plate. The resistors and capacitors which form the motor governor contact filter used with the governed series motor are mounted on a bracket alongside the motor. These filters suppress sparking of the governor contacts.

53. Motor Governor

A governor is used on series motors to maintain proper operating speed. It consists essentially of a pair of centrifugally controlled contacts which shunt a resistor in the motor circuit. When the motor is not running, the contacts are closed and a low-resistance path is connected across the terminals of the governor resistor. When the motor is connected to the power supply, the armature begins to turn. Its speed increases until the centrifugal

force causes the governor contacts to open. The speed at which the contacts just open is called the critical speed. The opening of the contacts removes the low-resistance path across the governor resistor. This increase in the resistance of the motor circuit reduces the current through the motor and causes a drop in the speed. When the speed has dropped below the critical speed, the contacts close and the cycle repeats. The contacts open and close several times a second, producing an average speed that is almost constant. The critical speed can be changed by varying the tension of the governor contact spring. This is done by turning the governor adjusting wheel. Pressing the governor adjusting bracket against the governor adjusting wheel turns the adjusting wheel counterclockwise and reduces the critical speed. Pressing the adjusting lever turns the governor adjusting wheel in a clockwise direction and increases the critical speed. Changing the critical speed of the motor governor adjusts the motor to its correct average speed.

54. Transmitting Distortion

a. GENERAL. With bias provided by the test set, all *space-to-mark* transitions are advanced or retarded with respect to the beginning of the start pulse of a teletypewriter character. End distortion differs in that all *mark-to-space* transitions are advanced or retarded with respect to the beginning of the start pulse. Signal traces for spacing and marking bias and spacing and marking end distortion as transmitted by the test set and controlled by the settings of the BIAS-END DIST and MARK-ZERO-SPACE keys are shown in (*a*), (*b*), (*c*), and (*d*), figure 15. Signal traces (*e*), (*f*), (*g*), and (*h*) are identical with the first four except that the beginnings of the start pulses are brought into line with each other to illustrate the

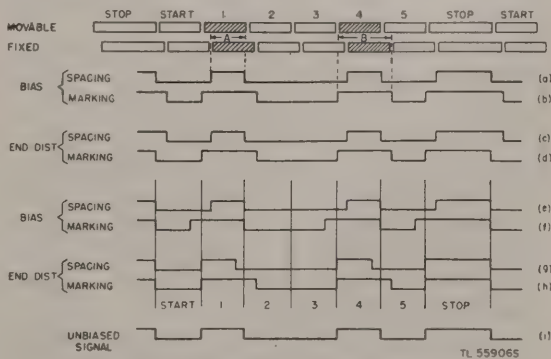


Figure 15. Examples of distorted signals.

manner in which the signals appear to a receiving start-stop selector mechanism. Signal trace for unbiased signals is shown in (i), figure 15.

b. SPACING BIAS. With the BIAS-END DIST key set at BIAS and the MARK-ZERO-SPACE key at SPACE, the segments of the segmented rings are connected as shown in figure 16. Since the segments are connected in series, current flows only during the time these segments overlap and the beginning of the space impulse is retarded. (See fig. 15 (a.))

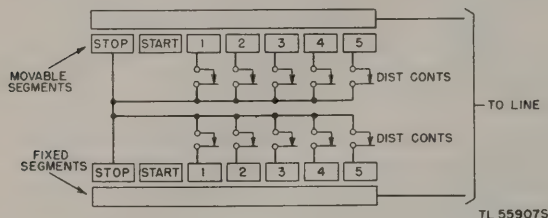


Figure 16. Connections for spacing bias.

c. MARKING BIAS. With the BIAS-END DIST key at BIAS and the MARK-ZERO-SPACE key at MARK, the segments are connected as shown in figure 17. Since the segments are connected in parallel, current flows as illustrated in (b), figure 15 and the beginning of the mark impulse is advanced with respect to the start pulse.

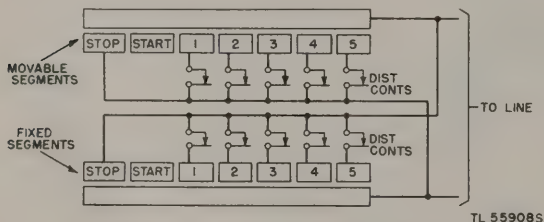


Figure 17. Connections for marking bias.

d. SPACING END DISTORTION. With the BIAS-END DIST key at END DIST and the MARK-ZERO-SPACE key at SPACE, the segments are connected as shown in figure 18. Since the segments are again connected in series, the end of the space impulse is advanced and current will flow when the selected segments overlap. (See (c), fig. 15.) Note that the start and stop segments of the movable segmented ring are connected, resulting in a start pulse always equal to a unit length pulse.

e. MARKING END DISTORTION. With the BIAS-END DIST key at END DIST and the MARK-

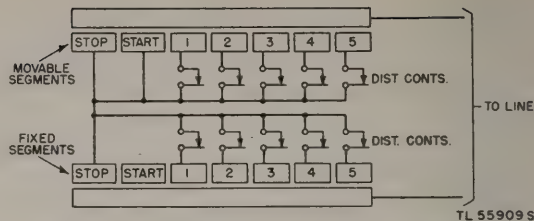


Figure 18. Connections for spacing end distortion.

ZERO-SPACE key set at MARK, the segments are connected as shown in figure 19. In this case only one stop segment is used and the selecting segments are connected in parallel. The end of the marking impulse is delayed and the resultant current flow is shown in (d), figure 15.

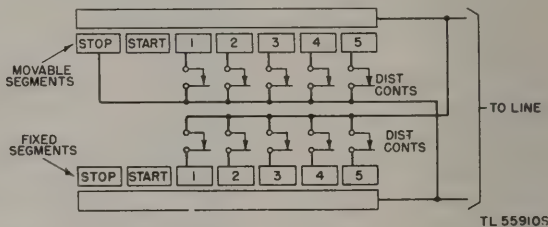


Figure 19. Connections for marking end distortion.

f. UNBIASED SIGNALS. Undistorted signals are obtained from the fixed segmented ring and its associated commutator rings with the BIAS-END DIST switch in its neutral position and the MARK-ZERO-SPACE key at ZERO. The resultant current pulse is shown in (i), figure 15.

g. DISTORTION CONTROL. The amount of distortion is controlled by the INCREASE DISTORTION knob which is geared to the outer movable segmented distributor disk. Turning this disk changes the relative position of the movable disk with respect to the fixed segmented disk. The more out of line the two disks are, the more distortion there is in the signal. The amount of distortion in the signal does not change the over-all length of the character code, which is still a 7.42-unit code.

Section XIII. TEST EQUIPMENT

55. Test Sets

a. VOLTOHMMETERS AND MILLIAMMETERS. Any common voltohmmeter or milliammeter is satisfactory for testing current flow, continuity, resistance, or voltage in Distortion Test Set TS-383/GG. When a voltohmmeter, milliammeter, or

combination test meter is included with a tool equipment, instructions for its use will be packed with the set.

b. **TEST UNIT I-236.** Test Unit I-236 is frequently furnished with teletypewriter equipment. It is designed to check the continuity of electrical circuits, to differentiate between a-c and d-c voltages, to check fuses, and to test capacitors. See TM 11-2056 for a complete description of this test set.

Section XIV. TROUBLE SHOOTING

56. Introduction to Trouble Shooting

a. **GENERAL.** A thorough knowledge of the functioning of each unit of Distortion Test Set TS-383/GG is of fundamental importance in analyzing trouble. The maintenance man must be able to determine quickly whether the trouble is due to a mechanical failure within a specific part of the equipment or whether the trouble is in some electrical circuit. The appearance of a particular operating failure may immediately indicate the exact location of the faulty adjustment or damage. If it does not, the maintenance man must determine exactly what parts are functioning properly and what parts are failing to do so.

b. **PROCESS OF ELIMINATION.** The isolation of trouble can usually be accomplished quickly by the process of elimination. If the test set, when connected into a circuit which was previously known to be in good operating condition, fails to give satisfactory service, the trouble is probably in the test set itself.

CAUTION: Do not disassemble any part of the test set or make readjustments until it is certain that the equipment is faulty.

c. **LOCALIZATION OF TROUBLE.** When it has been reasonably established that the trouble is within the test set, the next step is to localize the trouble to a particular electrical circuit or mechanical element. The trouble analysis chart given in paragraph 59 gives the most common troubles and the probable causes. Use this chart as a ready reference for locating the trouble.

57. Localizing Electrical Troubles

All electrical circuits are wired to terminal blocks mounted on the underside of the base, from where they are taken by cords and plugs to external des-

tinuations. Locating trouble in the different circuits is discussed in *a*, *b*, and *c* below.

a. **CODE DISK TRANSMITTER ASSEMBLY.** Trouble in the code disk transmitter assembly can be readily isolated. The code disk transmitter circuit operates only when the character selecting switch is in the TEST MESSAGE position. When trouble arises the transmitter can be isolated by turning the character selecting switch to any other character. If trouble persists it is not in the code disk transmitter.

(1) An open in any lead from the code disk transmitter will cause the impulse to be transmitted as a spacing or no-current impulse. This will give a partial garbling of the transmitted message.

(2) An open in either DISTORTION key may cause a no-current impulse to be sent out. It may also have the effect of sending out an undistorted signal when the distortion control switch is set for a distorted signal.

(3) A short in two leads from the code disk transmitter will cause a marking (current) impulse to be transmitted when one is not desired. It will have the same result as though two segments of the distributor were shorted.

b. **CONTROL CIRCUIT AND DISTRIBUTOR.** The various circuits are selected for operation by the character selecting switch. This switch changes the electrical circuit so that the desired signal is selected for transmission.

(1) An open in any of the leads from the character selecting switch will cause a spacing impulse to be transmitted, garbling the transmitted signal. In like manner, a short between any of the leads will cause an erroneous marking impulse to be transmitted. This can be localized by switching to the various signals.

(2) The most common electrical troubles caused by the distributor are excessive sparking and shorts between the brushes. Moisture and foreign particles occasionally accumulate between the ends of the segments and between the concentric rings. If the accumulation becomes great enough to short the segments, false impulses are transmitted. If the concentric rings are shorted, a steady marking signal is transmitted. Excessive sparking causes irregularities, or jittering, of the marking impulse.

c. **MOTOR CIRCUIT.** Motor circuit troubles depend upon the type of motor used. The most common trouble is caused by worn or dirty motor

brushes or by worn, burned, or shorted governor contacts.

58. Localizing Mechanical Troubles

Mechanical faults may develop in Distortion Test Set TS-383/GG, but little trouble should be experienced in localizing them if the logical sequence of checks outlined below is followed.

a. **CODE DISK TRANSMITTER ASSEMBLY.** After the set has been running a few minutes, set the character selecting switch to TEST MESSAGE. If the signal shows signs of garble or erroneous space impulses, turn the selecting switch to another character. If trouble no longer exists, the trouble probably is somewhere in the code disk transmitter assembly. To correct the trouble, see paragraphs 83 through 88 for the proper adjustment of transmitter contacts and contact levers.

b. **DISTRIBUTOR.** If errors continue to be trans-

mitted on all settings of the character selecting switch, it indicates a fault in the distributor. Shorted brushes or commutator rings will cause spasmodic errors and jittering in the transmitted signal. Consistent errors in all settings may indicate that there is a short in one of the DISTORTION keys when they are set in their neutral positions. If the spring adjustment of the key is faulty, adjust the key. Replace the key if the proper spring adjustment cannot be made.

c. **CONTROLS.** (1) *Character selecting switch.* Turn the character selecting knob to the various signals. If characters other than those selected are transmitted, the character selecting switch is at fault. Excluding trouble in the electrical circuit, the fault is probably open or dirty contacts or an incorrectly adjusted knob.

(2) *DISTORTION keys.* If distortion is present when the BIAS-END DIST key is in its neu-

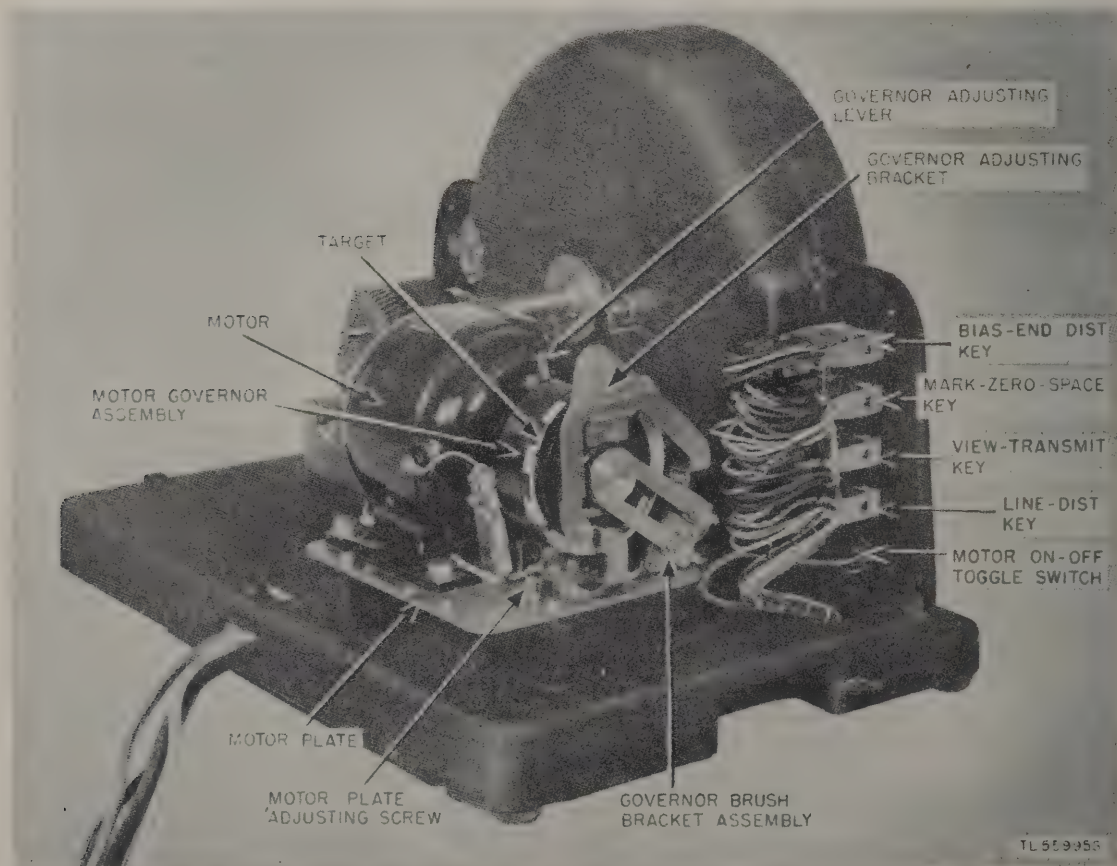


Figure 20. Distortion Test Set TS-383/GG, right rear view, cover removed.

tral position and the MARK-ZERO-SPACE key is set at ZERO, or if no distortion can be obtained with the keys set on any other position, the trouble is dirty or pitted contacts or incorrectly adjusted springs.

(3) *Distortion control.* If the distortion control does not increase or decrease the amount of distortion with the motor running, the RUN-STOP switch on STOP, the VIEW-TRANSMIT key on VIEW, and the DISTORTION keys set to transmit distortion, the trouble may be worn or incorrectly adjusted gears. The trouble may also be an open in the RUN-STOP switch or weak or incorrectly adjusted springs of the VIEW-TRANSMIT key or either DISTORTION key.

d. *MOTOR AND GOVERNOR.* If the test set seems to run too fast or too slow or if there is a marked fluctuation in the speed, the governor assembly

requires adjustment. Weak or poorly adjusted governor springs or pitted or dirty contacts will cause this trouble.

59. Trouble Analysis Chart

The most common trouble conditions that occur in Distortion Test Set TS-383/GG, together with a listing of the probable causes, are given in the chart below. This list of troubles does not represent all the troubles that might occur or all the possible causes for each condition, but it does include those reported to occur most frequently. Specific cases are listed as separate items. The possible causes or the items in which the causes may be found are listed under each heading. The references included after the corrective action furnish a cross reference to other paragraphs.

Condition	Possible trouble	Corrective action
Motor fails to start.	Power switch inoperative. Motor brushes dirty or inoperative. Motor slip connection spring, out of adjustment. Open connection in power cord.	Clean or replace switch. Clean or replace brushes. (See par. 68.) Adjust slip connection spring. (See par. 103.) Repair connection or replace cord.
Motor runs too fast or too slow. Governor cannot be adjusted.	Governor contacts dirty or inoperative. Governor brushes and contact disks dirty or inoperative.	Clean or adjust contacts. (See pars. 72 through 75 and 105 through 106.) Clean or adjust brushes and disks. (See pars. 76 and 77 and 107 through 109.)
Transmits garbled test message.	Dirty or inoperative transmitting contacts. Dirty or poorly adjusted stop contact. Code disk phasing out of adjustment. Open in leads to transmitting contacts. Shorted leads to transmitting contacts. Improperly adjusted distributor brushes.	Clean or adjust contacts. (See par. 83.) Clean or adjust stop contact. (See par. 84.) Phase code disks. (See par. 92.) Repair open. Remove short. Adjust brushes. (See par. 99.)
Sends garbled signals in all positions of character selecting switch.	Distributor segments shorted. Shorted wiring or leads from coding unit assembly. Improperly adjusted distributor brushes.	Remove short. Remove short. Adjust brushes. (See par. 99.)
Transmits characters other than those indicated by character selecting switch.	Transmitting contacts dirty or improperly adjusted. Code selecting knob positioned incorrectly on shaft. Code disk phasing out of adjustment. Shorted wiring or leads from coding unit assembly. Improperly adjusted distributor brushes.	Clean transmitting contacts (par. 30) or adjust (par. 83). Reposition knob. Phase code disks. (See par. 92.) Remove short. Adjust brushes. (See par. 99.)
Transmits garbled signals in one position of character selecting switch.	Open lead in circuit for that position. Shorted lead in circuit for that position. Transmitter contacts or stop contact improperly adjusted. Improperly adjusted distributor brushes.	Repair open. Remove short. Adjust contacts. (See pars. 83 and 84.) Adjust brushes. (See par. 99.)
Transmits spasmodically erroneous marking impulses.	Distributor segments dirty or shorted. Grounded lead in distributor circuit. Short in one of DISTORTION keys in neutral position. Improperly adjusted distributor brushes.	Clean segments (pars. 29 and 62) or locate short and remove. Remove ground. Remove short. Adjust brushes. (See par. 99.)

Condition	Possible trouble	Corrective action
Distortion cannot be obtained or is present at all times.	Distributor brushes shorted. Improperly adjusted distributor brushes. Transmitting commutator rings shorted. Short in leads to one of DISTORTION key contacts. Open in lead to one of DISTORTION key contacts.	Remove short. Adjust brushes. (See par. 99.) Remove short. Remove short. Repair open.
Amount of distortion cannot be increased or decreased.	Distortion control gears improperly adjusted or worn. Weak or poorly adjusted springs in VIEW-TRANSMIT key or in either DISTORTION key. Improperly adjusted distributor brushes.	Adjust gears (par. 82) or replace. Adjust springs (par. 100) or replace key. Adjust brushes. (See par. 99.)
Runs properly but fails to transmit signals.	Open in line cord. Short in line cord. Open connection on terminal block. RUN-STOP switch contacts shorted. Improperly adjusted VIEW-TRANSMIT key contacts. Improperly adjusted distributor brushes.	Repair open or replace cord. Remove short. Resolder connection. Remove short. Adjust contacts. (See par. 100.) Adjust brushes. (See par. 99.)
Incoming signals cannot be observed on stroboscope.	Stroboscope lamp fails to light. Open or shorted stroboscope cord. Shorted stroboscope commutator rings. Improperly adjusted distributor brushes. LINE-DIST key contacts improperly adjusted.	Check to see that external battery is supplied and is of sufficient voltage. If external battery voltage is reaching the lamp and it does not light, replace the lamp. Repair open or remove short. Remove short. Adjust brushes. (See par. 99.) Adjust contacts. (See par. 100.)

Section XV. REPAIRS

60. General Repair Information

a. Removal and replacement of defective parts or circuit elements of Distortion Test Set TS-383/GG is not difficult. With the face plate, the rear cover, and the base plate removed, all parts and circuit elements are easily accessible. However, particular care should be observed when servicing and repairing the test set to prevent further damage to the mechanisms and circuit elements. Except in cases of extreme emergency, only fully qualified personnel should attempt any repair to Distortion Test Set TS-383/GG.

b. Always use the correct tools in disassembly procedures. Tool Equipment TE-50, available to personnel of organizations to which Distortion Test Set TS-383/GG is issued, is adequate for all repair requirements except for major motor repairs.

c. Whenever it is necessary to disconnect a number of leads during the removal of a defective part, tag each lead so that it can be readily replaced in its proper location when reassembling the equipment.

d. Avoid using more solder than is necessary

when making solder connections. Excess solder dropped accidentally into the equipment may short-circuit other circuit elements.

e. Make a thorough electrical check of any part that is thought to be defective before removing it from the equipment. Never change the location of parts or wiring leads. Never substitute a longer lead or a lead of different material or higher gauge number. Such changes materially affect the accuracy of test equipment by altering circuit resistance values.

f. The repairs given in this section do not include all the emergency repairs it is possible to make. Determine the repairs to be made by the tools available. Repairs consisting of replacing worn parts, such as cords, plugs, toggle switches, keys, control knobs, etc., need no special instructions. Procedures for these replacements are not given in this manual. When making repairs and replacements involving contacts, contact springs, and mechanical placement of parts, see paragraphs 80 through 111 for the correct requirements and adjustments for those parts.

61. Cleaning Procedure for Major Overhaul

a. GENERAL. Clean equipment disassembled for

major overhaul by immersing or brushing the mechanical parts in vats of appropriate cleaning material or by wiping the parts thoroughly with a cloth dampened with the cleaning material.

CAUTION: Do not immerse, brush excessively, or dampen motor windings and armatures, equipment wiring, capacitors, and resistors.

b. **MATERIALS.** (1) *Solvent, dry-cleaning.* Remove oil, grease, gummy deposits, and small amounts of soluble materials such as dirt, dust, mud, paper, lint etc., with dry-cleaning solvent (SD), and wipe the equipment dry so that no film or residue remains. Do not use on rubber products or for cleaning items for which carbon tetrachloride is specified.

(2) *Oil, fuel, Diesel.* Clean exterior surfaces and other nonelectrical items with Diesel fuel oil and wipe the equipment thoroughly with a clean, dry cloth. Do not use on rubber products.

(3) *Carbon tetrachloride.* Clean electrical contact points, switches, the distributor disk, and the motor commutator.

(4) *Water.* Remove excessive amounts of mud and dirt with water.

c. **DRYING.** Wipe smooth-surfaced parts with a clean, dry cloth until they are dry. If possible, dry all parts that have been washed or flushed with water in an oven or under heat lamps for 1 to 2 hours at 160° F. Parts that have been washed with water or dry-cleaning solvent (SD) may be dried by using an air blast.

CAUTION: Be sure that all parts are dried thoroughly before reassembling the equipment.

62. Refinishing Distributor Disk

a. Loosen the 8543 and 5546 screws. (See figs. 20 and 30.) Push the lamp arm toward the hub so that the lamp arm assembly will clear the signal measuring scale, and remove the hub. Cover the main shaft opening on the distributor face with masking tape to protect the front main shaft bearing from metal particles and grit.

b. Wrap a piece of No. 000 sandpaper around a block of soft wood 2 inches long, 1¼ inches wide, and approximately ¾ inch high. Place the block on the concentric rings with the length of the block covering all four rings. Press down with the fingers. Rotate the block about the axis of the main shaft, avoiding undue pressure on any one point. When the concentric rings are almost smooth, remove the No. 000 sandpaper and re-

place it with No. 0000 sandpaper. Repeat the finishing process until the rings are smooth and polished. Do not remove any more metal than is necessary. Remove any grit or metal particles which may have accumulated between the rings.

c. Repeat the refinishing process on the segmented rings, holding the block lengthwise so that the width covers both rings.

d. After refinishing the distributor, trim off any burrs that may have formed on the ends of the segments of the outer rings. Coat the ends of the segments with a coat of insulating varnish to prevent copper particles from shorting the segments.

63. Removing Motor from Distortion Test Set TS-383/GG

Remove the motor from the test set for all repairs except replacement of motor brushes.

a. Unscrew or unsolder all motor leads and clip the lacing holding the wiring to the base of the motor. The governor and motor pinion need not be removed until the motor has been removed from the motor base.

b. Remove the three 74014 mounting screws (fig. 32) holding the motor plate to the base and lift the motor plate from the test set.

c. Unscrew the four 74567 screws (fig. 32) mounting the motor on the motor plate. Remove the motor.

64. Disassembling Motor for Repairs

a. Remove the governor adjusting bracket and governor, the motor pinion, and the external bearing retainer screws.

b. Remove the motor bolts and take off the end ball by prying gently with the blade of a screw driver. Lift out the armature.

c. Remove the armature bearings with a suitable bearing puller.

CAUTION: When pulling bearings with built-in dust shields, position the puller so that it presses on the outer bearing race only. Pressure exerted on the dust shield will crumple the shield and destroy the bearings. *Do not attempt to pull bearings with a screw driver.*

65. Cleaning Motor

a. Carefully dust nonoily dirt, dust, paper, and lint from the armature and field windings with a clean, dry sash brush (part of Tool Equipment TE-50).

b. Wipe oil, grease, and gummy deposits from

the face of the armature and field cores with clean cheesecloth dampened with dry-cleaning solvent (SD).

c. Immerse the end bells, motor pinions, and other all-metal parts in a vat of appropriate cleaning fluid. Use a sash brush to remove dirt, grease, and gummy deposits. Dry and lubricate the parts as directed for each of the cleaning fluids.

d. Rub dirt, oil, grease, and gummy deposits from the commutator with a piece of cheese cloth dampened with carbon tetrachloride.

66. Cleaning and Polishing Motor Commutator

a. If the motor brushes are sparking excessively, remove the armature and clean the commutator with carbon tetrachloride.

b. If excessive sparking cannot be corrected by cleaning, mount the armature between the centers of a lathe or between other fixed centers. Rotate the armature at about 200 or 300 rpm. Loop a piece of No. 000 or No. 0000 sandpaper around the commutator and hold one end in each hand. Apply enough tension to hold the sandpaper tight against the armature and slide it back and forth lengthwise, keeping the sandpaper approximately square with the surface of the commutator. Sand the commutator until it is bright and smooth. *Do not attempt to smooth the commutator with sandpaper unless a lathe or other fixed centers are available. Do not use emery cloth, carborundum paper, or steel wool.*

Note. Carbon particles from the motor brushes become imbedded in the commutator segments and darken them. This discoloration increases the life of the segments. Do not polish to remove this discoloration unless there is excessive sparking that cannot be corrected by cleaning.

67. Resurfacing Motor Commutator

If excessive sparking cannot be corrected by polishing, inspect the commutator carefully. The top of the segment insulators should be below the surface of the adjoining segments. If the segments are deeply grooved and the insulators are above the segments, the insulators raise the brushes off the segments every time the insulators pass under the brushes. This causes excessive sparking and increases wear of the segments. Correct this condition by turning down the commutator and undercutting the segment insulators.

Note. These repairs should be made only by personnel experienced in the use of the metal-turning lathe and undercutting tools.

a. Mount the armature between the centers of a metal-turning lathe. Check to see that the shaft is not out of line more than 0.0005 to 0.001 inch. Make a series of light cuts across the entire width of the commutator, starting the cuts on the side nearest the winding and feeding toward the outside end to avoid possible damage to the windings. Continue the cuts until all grooves and pits are removed. *Do not remove any more metal than necessary.*

b. Polish the commutator with a strip of No. 0000 sandpaper. (See par. 66b.)

c. Undercut the segment insulators until the top of each insulator is 1/64 to 1/32 inch below the surface of the adjoining commutator segments. Do not attempt to use special undercutting tools before reading the instructions furnished with them.

CAUTION: After the segment insulators have been undercut between all segments, remove all slivers of metal which may remain in the slots. Metal slivers will short the commutator segments and burn out the windings when the motor is started.

68. Replacing Motor Brushes

a. When removing motor brushes, identify the brush as right or left and mark the position of the brush in the holder so that the brush may be replaced in the same holder with the same side up-permost. If the brushes have an identifying mark on them use this as a guide.

b. Inspect the brushes as follows:

(1) Check to be sure that at least 5/8 inch of brush material remains.

(2) Check to be sure that at least one-third of the brush face is in contact with the commutator.

(3) Check to see that the brushes make contact across at least three-fourths of the long dimension of the brush face.

c. If the above requirements on either brush are not met, substitute a new brush which has been properly surfaced. (See par. 69.)

d. Reinsert old brushes in the same brush holder with the same side uppermost. Insert a new brush or a brush that has just been resurfaced with the numbered side up.

e. See that the brush moves freely in the brush holder. Check the pressure of the brush springs and see that they meet the specified requirements.

69. Surfacing Motor Brushes

Shape the brush face to the proper curvature as follows:

a. Wrap a piece of No. 0000 sandpaper around a section of the commutator under the brush holder and fasten in position with a piece of string.

b. Place the brush in the holder with the numbered or marked side up. The brush should bear against the sandpaper under the normal pressure on the brush spring.

c. Turn the commutator back and forth by hand until the brush surface has the proper curvature. The last turn of the armature should be in the normal direction of rotation. Lift the brush as it passes over the gap between the edges of the sandpaper.

d. Remove the brush and bevel the edges slightly with sandpaper.

e. Wipe off the brush with a piece of cloth dampened with carbon tetrachloride.

f. Be sure that the pigtail inside the brush spring is intact and free from kinks and that it will allow the brush spring to extend properly.

g. Clean any grit or dust from the brush holder with a cloth dampened with carbon tetrachloride wrapped around a screw driver blade or a tool of similar shape.

h. Insert the brush in the brush holder. (See par. 68d and e.)

70. Replacing Armature Bearings

a. If inspection of bearings indicate that they are burned, cracked, badly worn, or damaged in any way, install new bearings. All bearings found to be in good condition after cleaning and inspecting should be lubricated with proper lubricant (par. 41) before being placed on the shaft.

CAUTION: Be careful when handling the bearings, both before and after they are cleaned, so that no dirt will get inside the bearing races.

b. Use some type of arbor press or bench vise, if available, to press the bearings onto the armature shaft.

(1) Slip the bearings onto the armature shaft as far as they will go fingertight with the dust covers (when bearings are so equipped) nearest the windings.

(2) Place a block of wood about 1 inch longer than the shaft extension on one side of the shaft with one end bearing against the inner bearing race and the other against the vise jaw. Place the

other block, of equal length, against the other end of the armature shaft and the other vise jaw.

(3) Tighten the vise until there is an even pressure exerted on both sides of the bearing. *Be careful not to bend the shaft.* Tighten the vise slowly until the bearing is pressed completely against the shoulder on the armature shaft.

(4) Repeat the procedure to mount the bearing on the other end of the armature shaft.

71. Reassembling Motor

Thoroughly clean and dry the motor before reassembly. (See par. 65.) See that all parts are free from dirt and damage before reassembly is started.

a. Position the bearing retainer so that the holes match the position of the retainer screws.

b. Insert the armature into the field so that the bearing opposite the commutator end of the shaft enters the end bell. The bearing should enter the end bell without excessive forcing.

c. Remove the commutator brushes if they are still in the end bell. Place the end bell on the commutator end of the shaft and gently tap the end bells into place.

d. Replace the motor frame bolts. Tighten the sides alternately a little at a time in order not to skew the end bells.

e. Move the bearing retainer ring into position with a toothpick or piece of stiff wire so that the retainer ring screws can be started. Insert and tighten the retainer screws.

f. Replace the motor pinion.

72. Disassembling Governor

When it is desired to completely disassemble the governor, proceed as follows:

a. Loosen the two governor brush assembly mounting screws and slip the governor brush assembly to the left enough to clear the edge of the governor.

b. Remove the screw holding the governor to the motor shaft and slip off the governor.

c. Remove the screws securing the target and governor cover. Remove the target and cover.

d. Unhook the No. 6323 spring. (See fig. 40.)

e. Loosen the screw which clamps the feather spring on the end of the No. 6314 contact spring assembly (fig. 40) and lift the contact spring out of the governor shell.

f. Remove the nut and lockwasher on the No. 6320 contact screw (fig. 40) and lift out the contact screw.

73. Replacing Governor Contact Points

All governor contacts in good condition have an over-all grayish color. When the contacts cause trouble or become pitted or if the grayish color does not cover 75 percent of the contacting surfaces, replace *both* contacts with new contacts.

a. CONTACT POINTS ARE MADE OF TUNGSTEN. The contact point is attached to the spring by solder. Heat the contact point with a soldering iron and remove the point. The contact point is welded on the screw, and the contact and screw are replaced as a unit.

b. REPLACE SCREW WITH NEW SCREW AND CONTACT. Solder new points onto the contact spring. The new point on the contact spring is properly aligned when there is no appreciable gap between any part of the contacting surface of the point and a straightedge when the straightedge is held flat against the spring mounting plate to one side of the mounting screws.

Note. Old type No. 6314 contact springs are equipped with contact points which screwed into the spring and were bonded by a drop of solder at the end of the spring.

74. Repairing Governor Contact Points

For emergency operation when trouble is caused by build-ups or pitting and new contacts are not available, remove both contacts and *lightly* dress them with a fine carborundum stone (part of Tool Equipment TE-50). Knock a large build-up off with a screw driver and then dress the contacts with the carborundum stone. *Replace both contacts with new contacts as soon as possible.* Build-ups and pitting form quickly on resurfaced contacts.

75. Reassembling Governor

a. Insert the No. 6320 contact screw into the hole in its mounting block. Place a No. 2191 lock-washer and a No. 6345 nut on the end of the contact screw. Tighten the nut securely.

b. Insert the feather spring of the No. 6314 contact spring under the clamp on its mounting block and tighten the clamp screw until the contact spring is held friction tight. The contact should remain slightly separated (approximately 0.005 inch).

c. Hook the No. 6323 spring onto the contact spring and turn the adjusting wheel until all tension is released. Contacts should return to the slightly separated position of about 0.005 inch.

d. Insert a piece of white paper behind the con-

tacts. Illuminate the contacts with a flashlight or small lamp and turn the adjusting wheel until the contacts just touch.

e. Slide the contact spring to the right or left until the sides of the upper and lower contact points are in line. If a gap can be seen on either side of the contacts, loosen the contact mounting block retaining screw and move the top of the block to the right or left. At the same time, shift the contact spring to keep the contact points in line. Tighten both the contact spring clamp screw and the contact mounting block retaining screw.

f. If there is a gap at the front or back of the contacts, twist the feather spring on the end of the contact spring with a pair of long-nose pliers.

g. Repeat the operations until the contacts meet all requirements for position.

h. Turn the adjusting wheel until the tension of the No. 6323 spring is near the midpoint of its range.

i. Reassemble the governor cover and target on the governor and remount the governor on the motor.

76. Inspecting, Cleaning, and Repairing Governor Contact Disks

a. Clean governor contact disks with a piece of clean cheesecloth dampened with carbon tetrachloride. Contact disks should not be disturbed unless there is excessive sparking at the brushes.

b. Remove pits or burned spots from contact disks with No. 0000 sandpaper held by hand with the motor running at normal speed. Hold a piece of cloth with the sandpaper in such a way that cuttings and particles are immediately wiped off the disks.

CAUTION: Do not touch the surface of contact disks with the hand. Minute deposits of moisture or dirt will cause arcing and fitting.

77. Replacing End-Ring Governor Brushes

Replace the No. 78403 carbon brushes on the tips of the end-ring governor contact springs when the brushes have worked down to 1/16 inch. When it is not desired to replace the entire assembly, replace the individual brushes in the following manner:

a. Unsolder the old brush from the spring. Clean out any solder remaining in the hole from which the brush was removed. Insert the new brush in the hole and solder firmly in place.

b. Place the governor brush assembly in its

proper position and tighten the mounting screws.

78. Testing Repaired Governor

a. After the governor is completely reassembled and adjusted, set new contacts by running the motor on test for at least 1 hour. Check the speed every 15 minutes and immediately investigate any sudden change in motor speed.

b. If the motor speed is erratic, disassemble the governor and recheck the contacts for build-ups and alignment. If the contacts are built up, replace them. Realign the contacts, reassemble the governor, and run the motor again for 1 hour.

c. Operation of the governor is satisfactory if the motor speed has not changed appreciably at the end of the test run.

79. Painting and Refinishing

If the finish on the metal case of Distortion Test Set TS-383/GG has been badly scarred or damaged, touch up the bared metal surface to prevent rust and corrosion.

a. Clean the scarred surface down to the bare metal. Use No. 00 or No. 000 sandpaper to obtain a bright, smooth finish. Clean corroded metal with dry-cleaning solvent (SD). For severe rust, use dry-cleaning solvent (SD) to soften the rust and sandpaper to remove the rust.

CAUTION: Do not use steel wool. Minute particles of steel wool may drop inside the case or on exterior connections and cause harmful short circuits.

b. When only a touch-up job is necessary apply matching paint with a small brush. When numerous scars and scratches warrant a complete repainting job, mask the control panels, the distortion measuring scale, and all openings and spray-paint the entire case. Use authorized paint consistent with existing regulations.

Section XVI. REQUIREMENTS AND ADJUSTMENTS

80. Introduction

a. **GENERAL.** The data in this section include all mechanical requirements, detailed instructions for checking the requirements, and adjustment procedures for Distortion Test Set TS-383/GG. The adjustments are arranged in a sequence that would be followed if a complete readjustment of the test set were undertaken. Keep this in mind when a single adjustment is made because a change in

one adjustment may affect other adjustments. If one adjustment is changed, check all related adjustments.

b. **SPRING TENSIONS.** The spring tension values given in the following paragraphs are derived from measurements made with the appropriate spring scale (Teletype Corporation or equivalent as furnished with Tool Equipment TE-50). The scales are calibrated to read ounces or pounds (or both) in a vertical pull position. In other positions the readings are indications, not exact values. Replace springs not meeting specified requirements when no adjusting procedure is given.

c. **FIXED PIVOTS.** Solid black circles in the line drawings indicate fixed pivots, such as shafts, pivot pins, pivot screws, etc.

d. **PREALIGNMENT PROCEDURES.** Remove the test set cover, the hood, and the face plate, which is fastened to the distributor hub. Loosen the brush arm clamp screw, move the brushes away from the rings, and tighten the clamp screw.

81. Intermediate Gear Shaft Bearing Bracket (figs. 21 and 22)

a. **REQUIREMENT.** The intermediate gears should be favorably aligned with a barely perceptible amount of backlash. Check the upper and lower pair of gears.

b. **ADJUSTMENT.** Loosen the intermediate gear shaft bearing bracket mounting screws and position the bracket. Tighten the mounting screws.

82. Distortion Adjusting Gear Segment (fig. 21)

a. **REQUIREMENTS.** (1) With first one and then the other distortion adjusting idler gear stud against the stop plate, the teeth of this gear should mesh with its associated gear segment so that the mesh is equalized (within one tooth) between the extreme limits of travel of the gear segment.

(2) There should be a slight amount of backlash between the gear and the segment throughout the travel of the segment.

b. **ADJUSTMENTS.** (1) Remove the distortion adjusting idler gear by means of its mounting screw. Reinstall it so that the requirement is met.

(2) For backlash, loosen the three gear segment mounting screws and position the segment. Tighten the mounting screws.

83. Transmitting Contacts

Note. The transmitting contact assemblies are numbered from 1 to 5, with number 5 being toward the front of the test set.

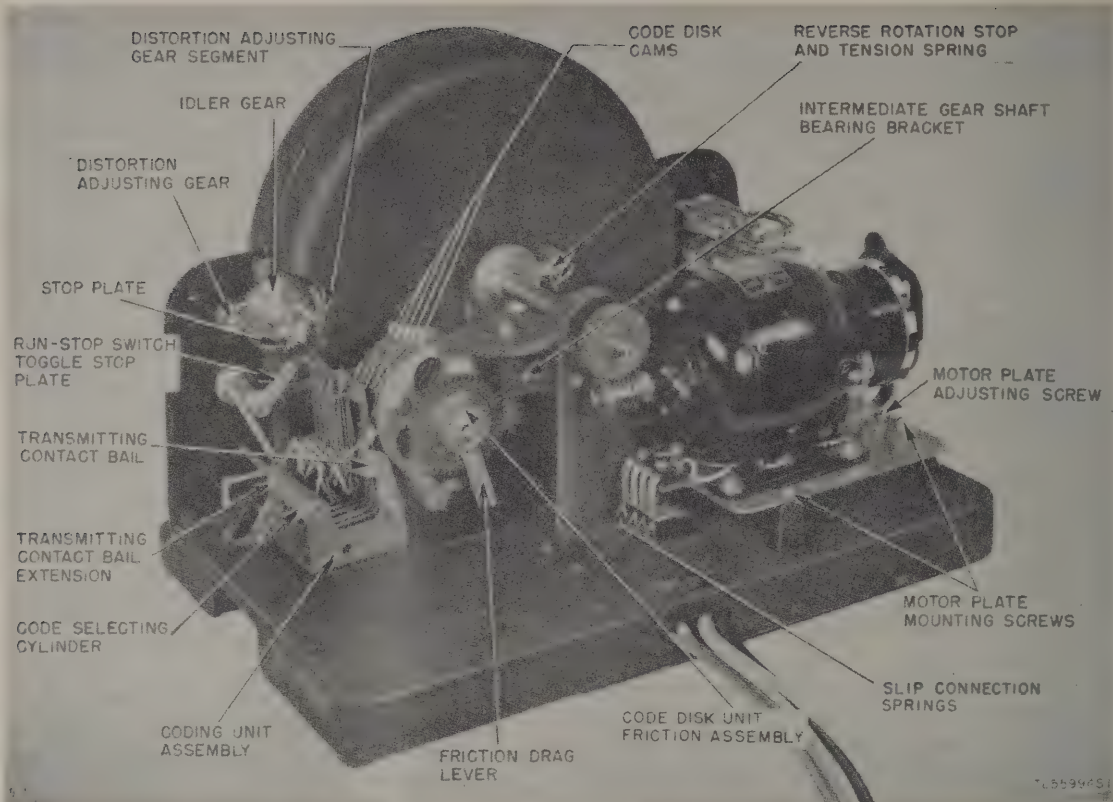


Figure 21. Distortion Test Set TS-383/GG, left rear view, cover removed.

a. CODE SELECTING SWITCH AT R. (1) Requirement. There should be a 0.015- to 0.025-inch gap between each pair of contact points of the numbers 1, 3, and 5 contact assemblies. (See A, fig. 23.)

(2) Adjustment. Bend the short contact springs and their stiffeners to the required gap.

b. CODE SELECTING SWITCH AT Y. (1) Requirement. There should be a 0.015- to 0.025-inch gap between each pair of contact points of the numbers 2 and 4 contact assemblies. (See A, fig. 23.)

(2) Adjustment. Bend the short contact springs and their stiffeners to the required gap.

c. CODE SELECTING SWITCH AT TEST MESSAGE, CONTACT LEVERS ON HIGH PARTS OF CAMS.

(1) Requirement. There should be a 0.015- to 0.030-inch gap between each pair of contact points. (See B, fig. 23.)

(2) Adjustment. Loosen the coding unit mounting screws. The heads of these screws can be reached only from underneath the base. Position the coding unit (fig. 21) and tighten the mounting screws.

d. CODE SELECTING SWITCH AT TEST MESSAGE, CONTACT LEVERS ON LOW PARTS OF CAMS.

(1) Preparation. Rotate the code disk cams (fig. 19) until the number 1 contact lever rests on a low part of its cam.

(2) Requirement. Hold the number 1 contact lever against its cam and hook an 8-ounce scale on the top of the contact shield spring. (See C, fig. 23.) It should require 1 to 2 ounces to pull the spring away from the contact lever. Check each contact shield spring in the same way with each contact lever on a low part of its cam.

(3) Adjustment. Bend the contact shield springs.

Note. There should be at least 0.015 inch of clearance between the contact shield spring and the inside short contact spring. (See B, fig. 23.) If the position of the contact shield springs is changed in any manner, recheck the contact gaps.

e. SHORT CONTACT SPRINGS. (1) Requirement. With the push end of a 8-ounce scale applied at right angles to the contact point of each short con-

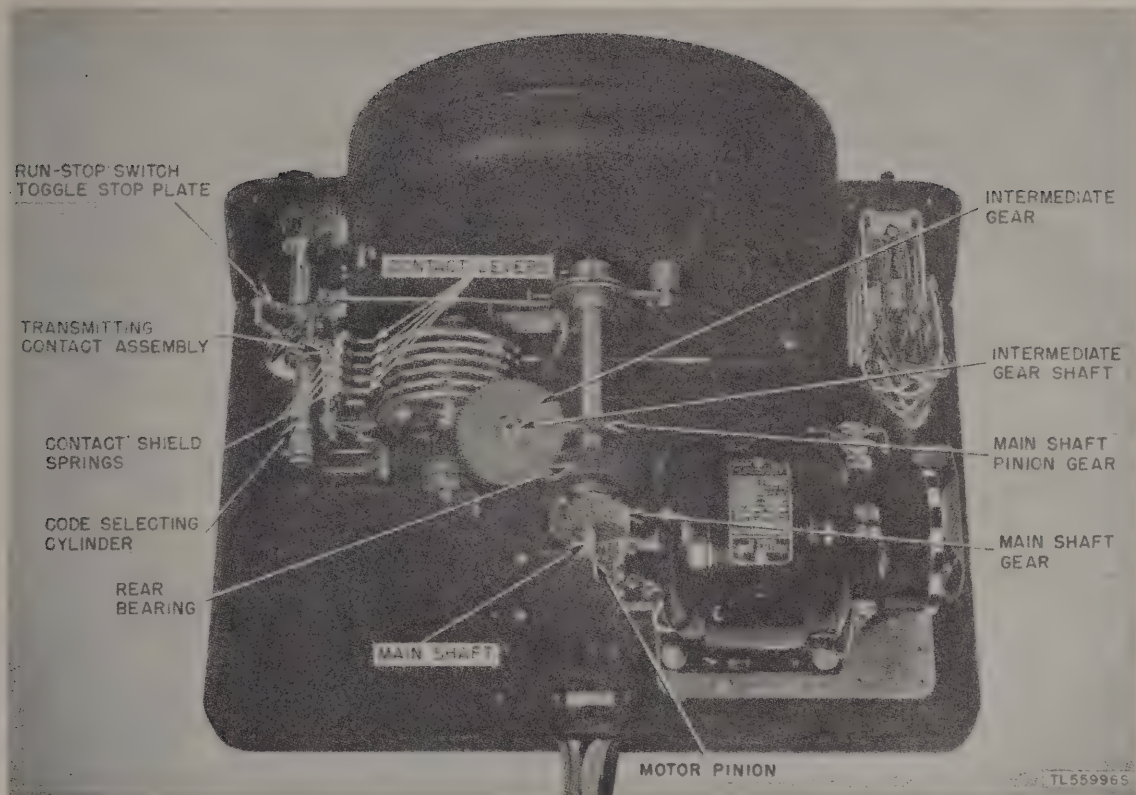


Figure 22. Distortion Test Set TS-383/GG, top rear view, cover removed.

tact spring, it should require at least 1 ounce to start each spring moving away from its stiffener.

(2) *Adjustment.* Bend the short contact springs.

f. OUTER LONG CONTACT SPRINGS (1) *Requirement.* Set the code selecting switch to BLK. Hook an 8-ounce scale on the top of each outer long contact spring and pull at right angles. It should re-

quire 1 to 2 ounces to start each spring moving away from its inner long contact spring.

(2) *Adjustment.* Bend the outer long contact springs.

g. INNER LONG CONTACT SPRINGS (1) *Requirement.* Set the code selecting switch to BLK and hold each outer long contact spring away from its inner long contact spring. Hook an 8-ounce scale

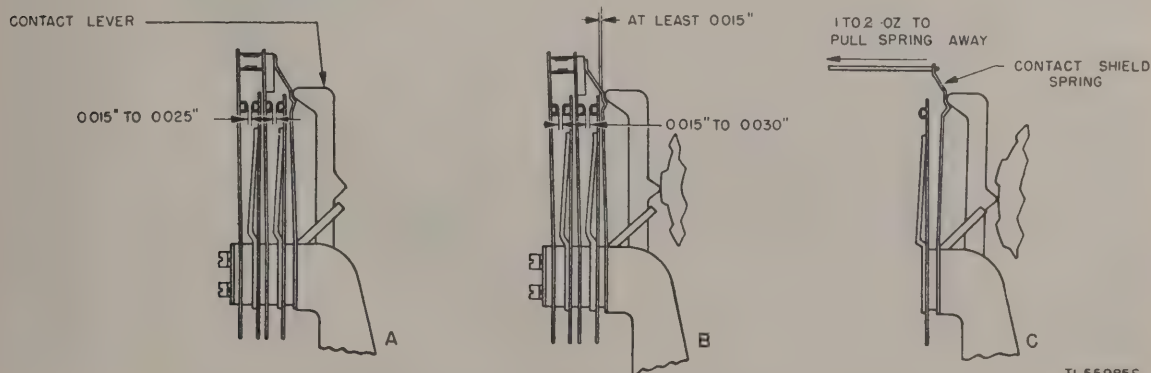


Figure 23. Distortion Test Set TS-383/GG, transmitting contact requirements.

over the top of each inner spring. It should require 1 to 2 ounces to start each inner spring moving away from its shield spring.

(2) *Adjustment.* Bend the inner long contact springs. Recheck adjustments given in *c* and *e* above.

84. Stop Contact (fig. 24)

a. STOP CONTACT GAP. (1) *Requirement.* With the stop contact lever held away from the stop contacts, there should be a 0.006- to 0.015-inch gap between the contact points.

(2) *Adjustment.* Bend the contact spring stiffeners.

b. LOWER STOP CONTACT SPRING. (1) *Requirement.* Apply the push end of an 8-ounce scale to the lower contact spring at the contact point. Push vertically downward. It should require 1 to 2 ounces to start the contact spring moving away from its stiffener.

(2) *Adjustment.* Bend the spring.

c. UPPER STOP CONTACT SPRING. (1) *Requirement.* Hold the stop contact lever away from the stop contact and apply the push end of an 8-ounce scale to the upper contact spring at the contact point. Push vertically downward. It should require 1 to 2 ounces to start the contact spring moving away from its stiffener.

(2) *Adjustment.* Bend the spring.

85. Stop Contact Bracket (fig. 24)

a. REQUIREMENT. Place the stop contact lever in its upper latched position and turn the RUN-STOP knob to STOP. There should be a 0.004- to

0.012-inch clearance between the post on the stop contact lever and the insulator on the upper contact spring.

b. ADJUSTMENT. Loosen the stop contact bracket mounting screws and position the bracket. Tighten the mounting screws.

86. Stop Contact Lever Latch Cam (fig. 24)

a. REQUIREMENT. Place the stop contact lever in its upper latched position and turn the RUN-STOP knob to STOP. Turn the main shaft slowly by hand until the lever latch cam just unlatches the contact lever. The distributor brushes should be $\frac{1}{8}$ to 1 inch beyond the beginning of the stop segment on the fixed disk.

b. ADJUSTMENT. Adjust the lever latch cam by its set screw. Allow clearance between the cam and the back casting.

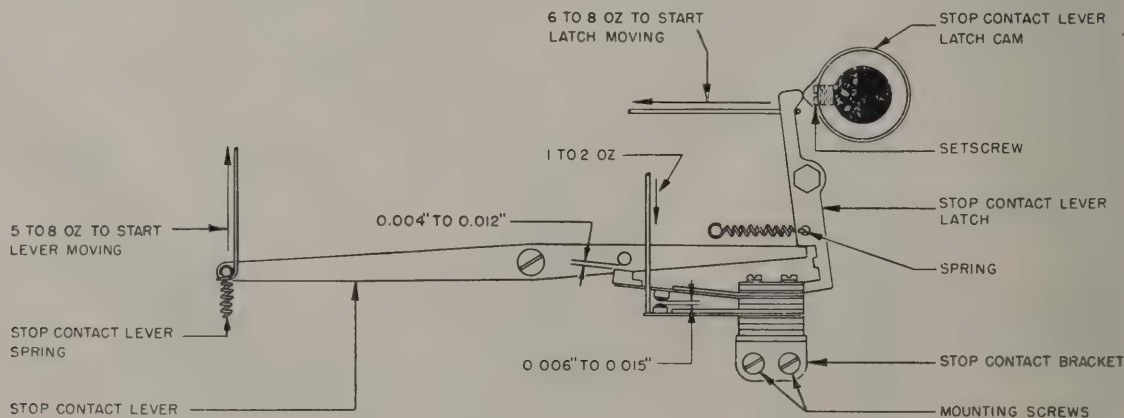
87. Stop Contact Lever Latch Spring (fig. 24)

a. REQUIREMENT. With the stop contact lever latch on the high part of its cam and the stop contact lever held away from the shoulders of the latch hook an 8-ounce scale over the stop contact lever latch near the top and pull in line with the spring. It should require 6 to 8 ounces to start the latch moving.

b. ADJUSTMENT. If the spring does not meet the requirement, install a new spring.

88. Stop Contact Lever Spring (fig. 24)

a. REQUIREMENT. With the stop contact lever latch on the high part of its cam and the RUN-STOP knob set at RUN, hook an 8-ounce scale



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Figure 24. Distortion Test Set TS-883/GG, stop contact requirements.

over the spring post on the end of the stop contact lever. Pull up in line with the spring. It should require 5 to 8 ounces to start the lever moving.

b. ADJUSTMENT. If the spring does not meet the requirement, install a new spring.

89. Run-Stop Switch Toggle Stop Plate Spring (figs. 21 and 22)

a. REQUIREMENT. With the RUN-STOP knob at RUN and the stop contact lever in its lower latched position, hook an 8-ounce scale over the large spring post on the switch toggle stop plate. Pull at right angles to the spring. It should require at least 4 ounces to start the toggle plate moving.

b. ADJUSTMENT. If the spring does not meet the requirement, install a new spring.

90. Transmitting Contact Bail Spring (fig. 21)

a. REQUIREMENT. With the code selecting knob at TEST MESSAGE, apply the push end of a 12-pound scale to the tip of the bail extension close

to where the extension presses against the underneath part of the code selecting cylinder. It should require at least 2 pounds to start the extension moving down away from the code selecting cylinder.

b. ADJUSTMENT. If the spring does not meet the requirement, install a new spring.

91. Code Disk Shaft (fig. 21)

a. REQUIREMENT. The code disk shaft should have some end play but not more than 0.005 inch.

b. ADJUSTMENT. Loosen the code disk sleeve mounting screw and position the sleeve and shaft. Tighten the mounting screw.

92. Code Disk Phasing (figs. 21 and 25)

a. REQUIREMENT. Turn the code selecting knob to TEST MESSAGE and rotate the brush shaft until the number 3 outer contacts close. The brush for the inner (stationary) segmented distributor ring should not be more than three-fourths of a segment length in either direction

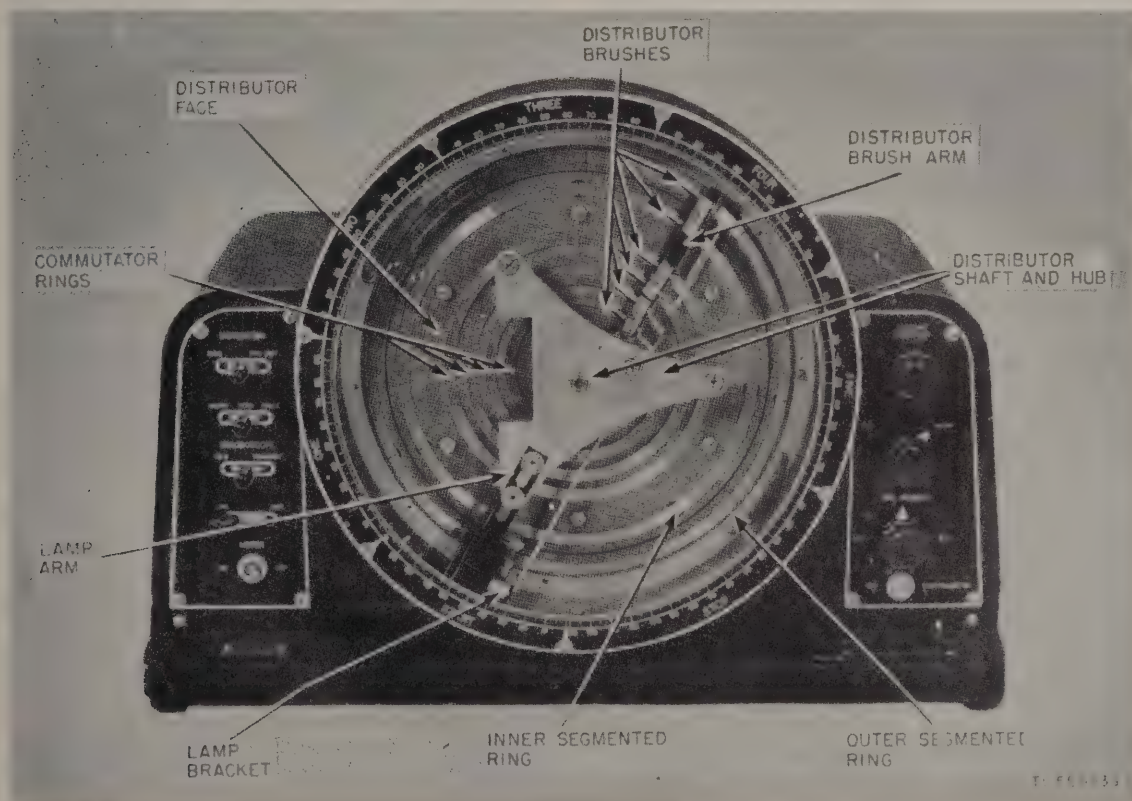


Figure 25. Distortion Test Set TS-383/GG, front view, face plate removed.

from the gap between the stop and start segments.

b. ADJUSTMENT. Loosen the nut on the upper end of the intermediate gear shaft. Rotate the code disks until the number 3 outer contacts barely close. Hold the disks stationary and rotate the brush shaft until the brush for the outer ring of the fixed disk is at the gap between the stop and the start segments. Tighten the nut on the intermediate gear shaft.

93. Code Disk Unit Friction Assembly (fig. 21)

a. REQUIREMENT. Run the motor 10 minutes or longer and then apply the push end of a 32-ounce scale to the end of the friction drag lever. Push at right angles to the drag lever. It should require 20 to 32 ounces to hold the lever against the stud.

b. ADJUSTMENT. Loosen the locknut on the end of the code disk shaft and regulate the tension by tightening or loosening the capstan (slotted) nut.

94. Main Shaft Gear Friction Clutch

Note. This adjustment does not apply to equipments having the main shaft equipped with a direct-drive gear hub instead of a friction clutch.

a. REQUIREMENT. Hold the motor shaft to keep it from turning. Hook a 64-ounce scale over the edge of the slotted part of the lamp arm (fig. 25) and pull at right angles to the arm. It should require 40 to 48 ounces to barely start the main shaft turning.

b. ADJUSTMENT. Loosen the locknut and regulate the tension by tightening or loosening the capstan nut. Tighten the locknut.

95. Outer Ring Brake Torsion Spring (fig. 21)

Note. This adjustment applies only to units equipped with a brake which bears against the outer ring on its upper left-hand quarter. (See par. 5*d*.) The brake acts to retain the position to which the ring has been set.

a. REQUIREMENT. Hook an 8-ounce scale over the end of the brake lever and pull at right angles to the lever. It should require a pull of 5 to 8 ounces to lift the lever from the outer ring.

b. ADJUSTMENT. Loosen the locknut on the brake lever mounting stud and turn the stud. Tighten the locknut.

96. Reverse Rotation Stop Spring

a. REQUIREMENT. Unhook the spring from the wedge and hook a 32-ounce scale in the spring eye. Pull in line with the spring hole. It should re-

quire a pull of 12 to 18 ounces to pull the spring to its position length.

b. ADJUSTMENT. If the reverse rotation stop spring does not meet its requirement, replace the spring.

97. Indicating Lamp Arm (fig. 25)

a. REQUIREMENT. The face of the slotted part of the lamp arm should be approximately in line with the face of the scale. There should be some clearance, but not more than 0.006 inch, at the point of least clearance between the end of the slotted part of the lamp arm and the edge of the scale plate.

b. ADJUSTMENT. Loosen the lamp arm mounting screws and position the arm. Tighten the mounting screws.

98. Indicating Lamp

a. REQUIREMENT. The indicating lamp should throw the brightest light possible through the slot in the lamp arm. Observe the brilliance of the lamp with the face plate installed and the motor running.

b. ADJUSTMENT. Remove the face plate, loosen the lamp bracket mounting screw, and position the bracket. Tighten the mounting screw.

99. DISTRIBUTOR BRUSHES (fig. 25)

a. REQUIREMENT. The ends of the distributor brushes should be cut square and be free from dangling fragments. The brushes should be straight and should extend $\frac{3}{4}$ inch from the brush arm at right angles.

b. ADJUSTMENT. Loosen the brush clamp screws and position the brushes. Tighten the clamp screws. Loosen the brush arm clamp screw and move the brushes against their rings until the post on the brush arm is against its stop post.

100. Key Contact Assembly

a. PREPARATION. Remove the screws holding the plate on the left-hand operating panel and remove the screws holding the keys to the panel. Remove the toggle switch and remove the panel. Be careful not to disconnect or break the wiring.

Note. The normal (unoperated) position of the key is that position in which the lever is perpendicular to the key top and the outside spring assemblies are unoperated.

b. REQUIREMENTS. (1) *Lever movement.* Operate the keys to each position. See that the cam

turns freely in its bearings and that the hard rubber rollers turn freely. Gauge by eye and feel.

(2) *Lever release.* A minimum of $1\frac{3}{4}$ ounces is required to restore the key lever from a locked position. To check this requirement, apply pressure with a suitable gauge at the top portion of the handle and perpendicularly to it. The lever should return unaided from the locked position before it has traveled 10 degrees from the extreme locked position.

(3) *Relation of plunger spring to rollers and cam.* The clearance between the lip and the bend at the top of the crook plunger spring should be between 0.004 and 0.020 inch when the roller on the cam has operated the spring combination on the opposite side. Gauge by eye. With the key unoperated, the inclined part of the crook spring should press against the vertical part, but a slight air gap will be satisfactory. Gauge by eye.

(4) *Relation of plunger springs to cam and key frame.* The plunger spring should clear the cam by a minimum of $1/32$ inch, and the vertical center line of each spring should be approximately perpendicular to the key top. Gauge by eye.

(5) *Contact alignment.* The contacts should line up so that the point of contact falls wholly within the boundary of the opposing contact when the contacts are operated. Gauge by eye.

(6) *Contact separation.* The separation between any pair of contacts normally open or between any pair of contacts that are opened when the key is operated should be a minimum of 0.014 inch (on adjustment, a minimum of 0.016 inch). Gauge by eye. When the key is operated to one side, the unoperated spring combination should not change the adjustment beyond the requirement for the normal position.

(7) *Contact pressure.* (a) Hook a suitable scale over each closed contact in turn. The pressure between all closed contacts should be a minimum of $1\frac{3}{4}$ ounces (on adjustment, a minimum of 2 ounces).

(b) The pressure between the inner follow spring and the plunger spring should be 8 ounces when all the spring assemblies are in their normal position or $10\frac{1}{2}$ ounces when the opposite spring assembly is operated.

(c) The plunger springs should rest against their associated stop spring when the lever is unoperated.

(8) *Contact follow.* All contacts should have a

follow of at least 0.008 inch (on adjustment, at least 0.010 inch).

(9) *Contact sequence.* All normally closed contacts should break before any of the normally open contacts make by at least 0.005 inch (on adjustment, at least 0.006 inch.) Gauge by eye.

c. ADJUSTMENTS. (1) *Lever movement.* If the lever does not return to its normal position when released, or if the movement is not smooth throughout its reverse travel, the trouble may be caused by badly adjusted crook and locking plunger springs resting against the roller with too much pressure. Adjust the springs close to the spring pile-up with a duck-bill pliers so that they just rest against the roller when the lever is in its locking positions. If the above procedure does not remove the binding, replace the key.

(2) *Contact alignment.* If the contacts do not line up satisfactorily, loosen the spring assemblies with a suitable screw driver and shift the springs until each contact point lies wholly within its opposing contact, as near the center as possible. Tighten the screws securely. The springs should be as nearly parallel to the mounting strips as can be judged by eye. After aligning the contacts, check to see that all other requirements are met. (See b(2), (4), and (6) through (9) above.)

(3) *Contact separation, pressure, follow, and sequence.* (a) Place a suitable adjuster on the spring just back of the contact and slide it down to where the spring enters the spring pile-up. Adjust the spring to the right or left, as required. Be careful not to disturb the adjacent springs.

(b) If the desired adjustment cannot be made by adjusting, place the adjuster on the spring below the contact, slide the adjuster down to the spring pile-up, and draw the adjuster upward the length of the spring while applying pressure so that the spring makes a slight gradual bow with the concave surface facing the associated spring. Move the adjuster back to the base of the spring and make the adjustment given in (a) above.

CAUTION: Do not straighten kinked springs unless the kink interferes with the proper adjustment of the spring assembly. Removing kinks tends to weaken the spring and to shorten its life.

101. Motor Position (figs. 21 and 22)

a. REQUIREMENT. The center line of the main shaft gear should coincide with a vertical line through the center of the motor pinion.

b. **ADJUSTMENT.** Loosen the motor plate mounting screws, position the motor, and tighten the mounting screws.

102. Motor Plate (figs. 21 and 22)

a. **REQUIREMENT.** There should be a barely perceptible amount of backlash between the motor pinion and the main shaft gear. Check for one complete revolution of the main shaft.

b. **ADJUSTMENT.** Loosen the left (viewed from the front of the test set) motor plate mounting screw and the motor plate adjusting screw locknut. Loosen the two right plate mounting screws slightly. Change the height of the motor pinion by means of the adjusting screw. Tighten the adjusting screw locknut and the three motor plate mounting screws. Recheck the adjustment.

103. Motor Unit Slip Connection Spring (fig. 21)

a. **REQUIREMENT.** Hook a 4-pound scale over one of the end motor unit slip connection springs, just below the head of the terminal screw on the motor connection lock, and pull horizontally. It should require $2\frac{1}{4}$ to $3\frac{3}{4}$ pounds to barely break contact. Measure the pressure of the opposite end slip connection spring in the same way. Use a test lamp to see when contact breaks.

b. **ADJUSTMENT.** Remove the motor unit and bend the two end slip connection springs. Put a straightedge across the end springs. There should be some clearance, but not more than 0.015 inch between the middle connection springs and the straightedge. Bend the two middle springs to get the proper clearance. Replace the motor unit.

104. Motor Armature Thrust Spring Compression (fig. 26)

a. **REQUIREMENT.** Apply the push end of a 12-pound scale horizontally against the governor outer contact disk and push toward the pinion end of the motor. A push of at least 7 pounds is required to start to overcome the compression of the armature spring.

b. **ADJUSTMENT.** If the spring does not meet the above requirement, replace the spring.

105. Governor Shell (fig. 27)

a. **PREPARATION.** Remove the brush spring plate and governor cover. Remove the speed adjusting spring.

b. **REQUIREMENTS.** (1) The governor contact points should meet squarely and there should be at least 0.010-inch clearance between the governor spring bracket and the rim of the governor shell.

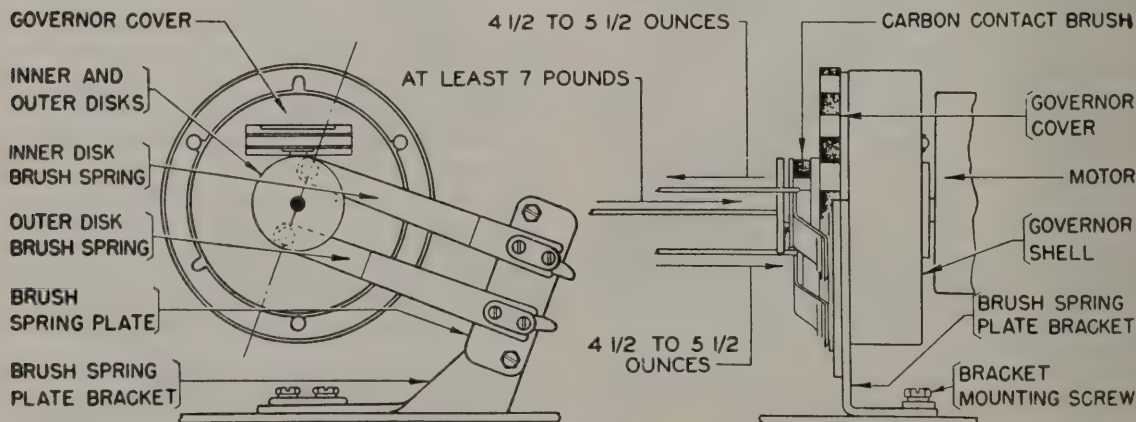
(2) There should be a gap of 0.015 to 0.040 inch between the governor contacts.

c. **ADJUSTMENTS.** (1) To adjust clearance between the governor spring bracket and the rim of the governor shell, remove the governor from its shaft and position the governor spring bracket by its mounting screws.

(2) To adjust the gap between the governor contacts, bend the governor contact spring as required.

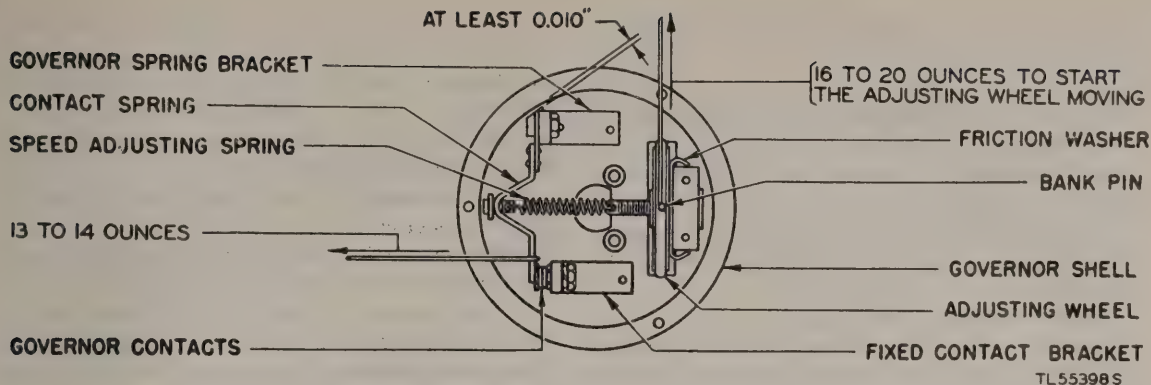
106. Governor Speed Adjusting Wheel Friction Washer (fig. 27)

a. **PREPARATION.** Replace the speed adjusting spring. Turn the speed adjusting wheel to the



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Figure 26. Motor armature thrust spring and governor brush spring requirements.



TL55398S

Figure 27. Governor speed adjusting wheel friction washer requirements.

right or left until a pull of 13 to 14 ounces just separates the governor contacts. Hook a 32-ounce scale over the spring arm near the contacts (fig. 27) and pull in line with the speed adjusting spring.

b. REQUIREMENT. Hook a 32-ounce scale over a bank pin inserted radially in the leather of the speed adjusting wheel and pull at right angles to the radius of the wheel. A pull of 16 to 20 ounces should be required to start the wheel moving.

c. ADJUSTMENT. Remove the friction washer and bend the large projections as required.

107. Governor Inner and Outer Disk Contact Springs (fig. 28)

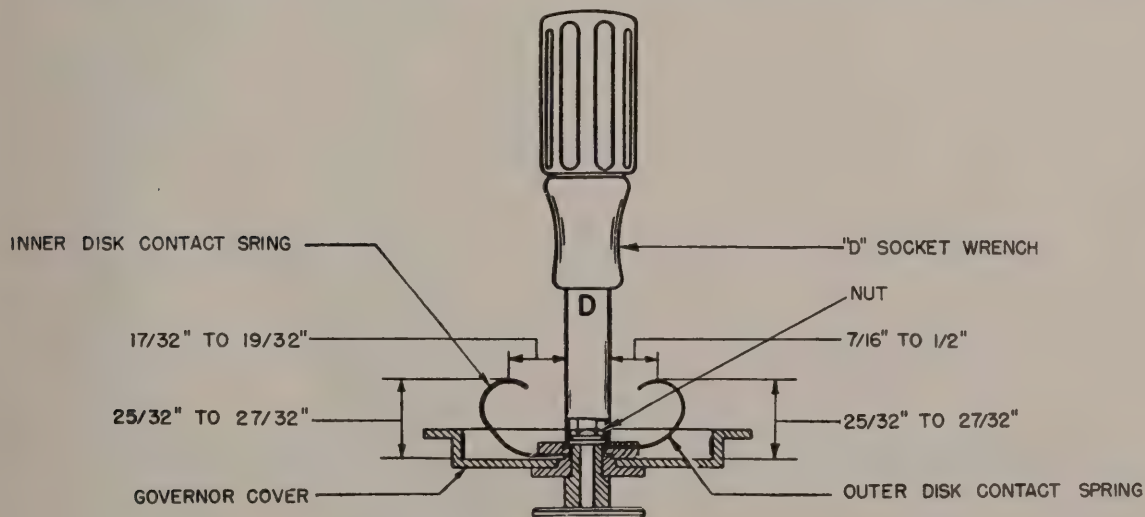
a. REQUIREMENTS. (1) The distance from the

inner surface of the governor cover to the highest point on the contact springs should be $25/32$ to $27/32$ inch.

(2) Place a D socket wrench over the nut located in the center of the governor cover. Measure the radial distance from the vertical surface of the wrench to the point where the scale touches the curved surface of the inner disk contact spring with a 6-inch scale. This distance should measure $17/32$ to $19/32$ inch.

(3) Measure the distance from the wrench to a point of contact on the outer disk contact spring in the same manner as described in (2) above. This distance should measure $7/16$ to $1/2$ inch.

b. ADJUSTMENT. Bend the inner and outer disk



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Figure 28. Governor inner and outer disk contact spring requirements.

contact springs as required. Avoid sharp bends or the springs may break.

108. Governor Brush Spring Plate Bracket (fig. 26)

a. PREPARATION. Replace the governor cover, target, and brush spring plate.

b. REQUIREMENTS. (1) A line through the center of the outer disk should pass through the center of each carbon contact brush.

(2) The surface of the brush spring plate bracket on which the brush spring plate is mounted should be in line with the outer surface of that part of the governor cover on which the target is mounted.

(3) The brush spring plate bracket should be parallel to the surface of the governor cover.

c. ADJUSTMENT. Loosen the brush spring plate bracket mounting screws and position the bracket. Tighten the screws.

109. Governor Brush Spring Pressure (fig. 26)

a. REQUIREMENTS. (1) Apply an 8-ounce scale

to the brush spring near each carbon brush and pull (inner disk brush spring) or push (outer disk brush spring) horizontally in line with the armature shaft. A pull or push of $4\frac{1}{2}$ to $5\frac{1}{2}$ ounces should be required to start each brush moving away from its associated disk.

(2) Both carbon brushes should lie flat against their associated disks. The outer edges of the brushes should be flush with, or not more than $\frac{3}{64}$ inch inside, the outer edges of the disks.

b. ADJUSTMENT. Loosen the two brush spring clamping screws and slip out the brush springs. Bend the springs as necessary. Remount the springs and position properly. Tighten the clamping screws.

110. Motor Speed

See paragraph 12 for instructions on adjusting the speed of the governor motor.

111. Procedure After Adjusting

Replace the face plate, the hood, and the test set cover.

APPENDIX I

REFERENCES

Note. For availability of items listed, check FM 21-6 and Signal Supply Catalog SIG 2. Also see FM 21-6 for applicable Technical Bulletins, Modification Work Orders, and Changes.

1. Parts Lists

SIG 4-1	Allowances of Expendable Supplies.
SIG 4-2	Allowances of Expendable Supplies for Schools, Training Centers, and Boards.
SIG 8-TS-383/GG	Higher Echelon Spare Parts for Distortion Set TS-383/GG.

2. Technical Manuals on Auxiliary Equipment and Test Equipment

TM 11-358	Telegraph Central Office Set TC-3.
TM 11-359	Line Units BE-77, BE-77-A, and BE-77-B.
TM 11-2056	Test Unit I-236.
TM 11-2208	Test Set TS-2/TG.

3. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
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4. Other Technical Publications

TM 1-455	Electrical Fundamentals.
TM 11-453	Shop Work.
TM 11-487	Electrical Communication Systems Equipment.

5. Forms

WD AGO Form 468	Unsatisfactory Equipment Report.
AAF Form 54	Unsatisfactory Report.

6. Abbreviations

ac	alternating current (noun).
a-c	alternating current (adjective).
BL	blue.
BLK	black.
C.R.	carriage return.
dc	direct current (noun).
d-c	direct current (adjective).
END DIST	end distortion.
GR	green.
hex.	hexagon.
hp	horsepower.
LET	letters.
L.F.	line feed.
L.G.	long.
LINE-DIST	line-distributor.
mf	microfarad (s).
Ω	ohm (s).

opm	operations per minute.
OR	orange.
ref	reference.
rpm	revolutions per minute.
spec	specification.
v	volt (s)
vps	vibrations per second.
w	watt (s).

APPENDIX II

MAINTENANCE PARTS

1. Maintenance Parts for Distortion Test Set TS-383/GG

The following information was compiled on 22 April 1946. The appropriate pamphlets of the Signal Supply Catalog for Distortion Test Set TS-383/GG are:

Higher Echelon Spare Parts:

SIG 8-TS-383/GG

For an index of available catalog pamphlets, see the latest issue of Signal Supply Catalog SIG 2.

2. Numerical List of Parts for Distortion Test Set TS-383/GG. (Sig. C Stock No. 3F4312)

Fig. No.	Ref. symbol	Name
33	34-1	NUT.
32, 33, 36, 37, 40	34-4	NUT.
37	34-59	NUT.
32	35-26	SPRING.
33	35-54	SPRING.
41	122-276	STRAP.
30	122-589	SPACER.
37	126-123	OUTLET BUSHING.
30	400-3	BRUSH.
32	500-205	SPRING.
32	1012	SCREW, shoulder.
30-33, 41	1026	SCREW.
42	1028	SCREW.
30	1051	SCREW.
40	1064	SCREW.
37	1100	SCREW, pilot.
41	1113	SCREW.
30, 32, 33, 41	1161	SCREW.
30	1162	SCREW.
29	1166	SCREW, key mounting.
38	1168	SCREW, lock.
36	1179	SCREW.
39	1266	SCREW.
32	1269	SCREW, block.
37	1272	SCREW.
30	2034	WASHER.
30, 32, 33, 36-41	2191	WASHER, lock.
33	2422	WASHER, lock.
42	2438	WASHER.
37	2443	WASHER, lock.
32, 33, 36, 41	2449	WASHER, lock.
30, 32, 33, 36, 37, 40, 41	2669	WASHER, lock.
32, 36, 37	2846	WASHER.
41	3094	INSULATOR.
32	3145	STOP PLATE.
32	3153	POST.
33	3339	NUT, lock.
33, 40	3438	WASHER.
30	3559	NUT.
39	3598	NUT.
33	3618	INSULATOR: 0.062".
30, 33, 40-42	3640	WASHER, lock.
33	3647	INSULATOR: 0.094".
33	3780	SPRING.
33	3870	SPRING.

Fig. No.	Ref. symbol	Name
33	4814	WASHER, lock.
42	4871	BOLT.
37	5061	BEARING, ball.
30	5446	SCREW.
29	5702	KEY.
35, 36	W-6104	NUT.
40	6314	SPRING ASSEMBLY, contact.
40	6318	CLAMP.
40	6319	BLOCK.
40	6320	SCREW, contact (with tungsten contact).
40	6323	SPRING.
40	6324	WHEEL, adjusting.
40	6330	BEARING ASSEMBLY (upper and lower).
40	6344	SCREW.
40	6345	NUT.
40	6347	SCREW.
40	6348	SCREW.
41	6745	SCREW.
37, 38	6746	SCREW.
32	6807	SCREW, set.
32, 36, 37, 40, 41	6811	SCREW, mounting.
40	6979	HUB.
30, 32, 33, 36-39, 41	7002	WASHER.
33	7048	SCREW.
37, 40	7105	TARGET.
33	7415	NUT.
37	7661	LEVER, adjusting.
37	8094	BRUSH (with spring).
40	8165	WASHER.
37	8222	STRIP, wearing.
41	8254	CLAMP.
29	8262	KNOB, key.
37	8330	WASHER.
20, 30	8543	SCREW.
32, 36, 37	8884	BLOCK, terminal.
41	34432	WASHER.
41	35503	FOOT: rubber.
39	36273	WASHER.
33, 38	41732	PLATE, clamping.
33, 38	41733	INSULATOR.
33	70497	NUT.
42	70724	INSULATOR.
37	70771	OILER.
37	70872	HOLDER, brush (with insulator).
37	70873	CAP, brush holder.
42	70887	NUT.
33	71156	SHIM.
37	71189	RETAINER, bearing.
37	71998	RING, brush holder: (with 80706 screw).
37	71999	SPRING, end play.
33	72565	WASHER, lock.
40	72835	POINT, contact.
29	73180	SWITCH, toggle.
37	73231	RETAINER, bearing.
37	73232	WASHER.
30	73235	SCREW.
37	73236	FRAME, field (with 70771 oiler).
37	73237	SHIELD, end (with 70771 oiler).
37	73239	ARMATURE.

Fig. No.	Ref. symbol	Name	Fig. No.	Ref. symbol	Name
37	73242	INSULATOR.	38	80335	PLATE, clamping.
37	73244	SCREW.	38	80336	INSULATOR.
42	73375	TERMINAL END ASSEMBLY.	38	80337	BRACKET.
31	73497	PLUG (red shell).	38	80338	BRACKET, adjusting: governor.
37	73595	WASHER, lock.	38	80340	PLATE, brush spring.
32	74104	SCREW, mounting.	37, 38	80341	GOVERNOR BRUSH AND SPEED ADJUSTING BRACKET ASSEMBLY.
33, 39	74059	SCREW.			
32, 36, 37	74091	PLATE, motor.			
41	74514	SCREW.	38	80342	SCREW.
32	74547	COLLAR.		80352	GOVERNOR ASSEMBLY, center contact.
32, 36, 37	74567	SCREW.	37, 40		
33	74717	SCREW.		80358	BEARING, ball (used at both ends).
30, 33	74805	SCREW.	35, 36		
32, 36, 37	74991	INSULATOR.		80444	SCREW.
41	75750	WASHER.	38	80460	CLAMP, cable.
33	76084	WASHER, friction.	41	80508	SCREW, segment.
33	76085	DISK, friction.	32	80558	SHIELD, end (with 80754 oiler).
33	76096	SPRING, friction.	35, 36		
33	76087	NUT.		80559	STUD, clamping.
41	76117	TERMINAL BLOCK MOUNTING ASSEMBLY.	34	80706	SCREW.
			33, 37		
			35, 36	80754	OILER (used at both ends).
30	76323	BUSHING.			
30	76377	BUSHING.	33	80757	SCREW.
36	76484	FAN.	33	81560	POST, spring.
33	77038	SPRING, contact: long.	42	81584	BRACKET.
32	77054	STUD.	33	81724	SPRING, contact: short.
41	77092	SCREW.	33	81726	TERMINAL.
39	77911	HOLDER, brush cap.	41	81825	CAPACITOR: 1/100 mf.
32, 37	77953	MOTOR UNIT, governed.	34-36	82283	MOTOR UNIT, synchronous.
41	78011	CAPACITOR: 1 mf.	39	82440	SCREW.
35-37	78025	SCREW.	31, 39	82474	TERMINAL.
30, 39	78028	SCREW.	41	82559	BUSHING.
41	78103	SCREW.	33, 39	82702	SCREW.
42	78205	RESISTOR: 700 ohms each.	35, 36	82839	ROTOR ASSEMBLY (with bearing and switch).
37	78204	CORE, field.			
37	78241	COIL, field.	35, 36	82840	ROTOR ASSEMBLY.
32, 33, 36, 37	78301	SCREW.	35, 36	82841	COMMUTATOR, switch.
38	78398	BUSHING.			
38	78399	SPRING brush: outer disk (with brush).	35, 36	82843	SPRING.
			35, 36	82845	WASHER (used at both ends).
38	78400	SPRING brush: inner disk (with brush).	35, 36	82848	HOLDER, brush (with brush).
38	78403	BRUSH, contact.			
41	78430	CLAMP.	34-36	82850	SHIELD, end (with 80754 oiler).
40	78437	INSULATOR.			
40	78438	BUSHING.	41	82867	RESISTOR: 7,000 ohms.
40	78439	SHELL, governor.	41	82870	RESISTOR: 6,300 ohms (4,300-2,000).
40	78443	DISK, outer contact.			
40	78451	COVER, governor.	33	83954	BUSHING.
40	78496	SPRING, contact: outer disk.	37	84047	STOP.
			33	84360	SHAFT.
40	78497	SPRING, contact: inner disk.	33	84363	COVER.
			32, 33	84368	ARM, clutch.
39	78905	WASHER.	33	84369	SLEEVE, friction.
33	79509	SPRING, contact: short.	33	84373	BUSHING.
33	79513	PLATE.	33	84379	HUB.
33	79516	SHIELD, contact.	33	84384	SPACER.
33	79517	STIFFENER.	33	84385	STUD, code disk.
33	79519	BUSHING.	33	84814	SCREW.
33	79523	SCREW.	33	84892	STIFFENER.
32	79894	SCREW, set.	30, 33	85559	WASHER.
33	80294	POST, spring.	35, 36	86713	SCREW.
35, 36	80299	SPRING, end play.	33	86746	SCREW.
34	80307	OUTLET (with 80308 bushing).	40	86868	BUSHING.
			40	86869	POST.
34	80308	BUSHING.	33	87406	DISK, code.
35, 36	80309	WASHER.	33	87413	DISK, code.
35, 36	80310	WASHER.	35, 36	88879	BRUSH HOLDER SUPPORT ASSEMBLY.
35, 36	80311	WASHER.			
35-37	80312	WASHER.	35, 36	89405	BUSHING.
35, 36	80313	WASHER.	35, 36	89406	WASHER.
38	80334	TERMINAL, contact.	35, 36	89407	PIN, cotter.

Fig. No.	Ref. symbol	Name	Fig. No.	Ref. symbol	Name
42	89925	TERMINAL END.	33	92435	DISK, code.
34-36	90263	STATOR, wound (with base).	33	92436	DISK, code.
37	91617	SHIM.	30	92437	LAMP.
29	91683	NUT.	32	92459	CYLINDER, code.
29	91684	NUT.	30	92813	INSULATOR, brush arm (with 92930 termi- nals).
37	91837	WASHER.			
29	92348	FRAME.	30	92930	TERMINAL.
29	92349	RING.	29	93075	NUT.
33	92350	BEARING, rear.	29	93136	SWITCH, toggle.
33	92351	BRACKET, bearing.	39	93141	SCREW.
29, 31	92352	BASE.	33	93667	SPRING, contact (with spacer).
29, 31	92353	COVER.			
30	92354	SEGMENT DISK AS- SEMBLY: inner.	35, 36	94707	INSULATOR.
30	92356	SEGMENT DISK AS- SEMBLY: outer.	39	95935	BUSHING.
30	92364	SEGMENT, retaining.	39	95936	COIL, retard.
30	92365	PLATE, retaining.	39	95937	CAPACITOR: 1/100 mf.
32	92366	WORM (with shaft).	39	95938	CAPACITOR: 1/10 mf.
33	92368	GEAR (with bushing).	31	96458	HOOD.
32	92369	BAIL, contact.	29	96460	PLATE, panel: right.
33	92370	LEVER, contact.	41	96461	BRACKET.
32	92372	BRACKET, contact.	29	96462	INSULATOR.
32	92375	GEAR SEGMENT.	33	96463	PULLEY.
33	92376	SPACER.	33	96464	WEDGE.
32	92378	HOLDER, oil wick.	33	96465	POST.
32	92379	OIL WICK.	36	96473	GEAR SET.
32	92380	PINION (with shaft).	37	96572	GEAR SET.
32	92382	SCREW, shoulder.	41, 42	96814	RESISTOR UNIT AS- SEMBLY.
32	92383	GEAR, idler.	37, 39	99250	MOTOR GOVERNOR FILTER ASSEM- BLY.
29	92384	PANEL: left.			
29	92385	PANEL: right.	39	99354	CONTAINER.
30	92387	INSULATOR.	39	99355	BRACKET.
30	92391	PLATE, clamp.	39	99356	BRACKET.
30	92392	ARM, brush.	39	99357	CLIP.
30	92395	CLAMP, lamp.	31	99762	PLUG.
30	92396	LAMP ARM ASSEM- BLY.	31	99763	CORD ASSEMBLY.
29	92397	SCALE, signal measur- ing.	31	99891	CORD.
33	92398	GEAR, worm.	41	102164	NAMEPLATE.
29	92399	PLATE, panel: left.	36	102662	PINION: 7T (with hub).
29	92401	DISK, cover.	36	102663	GEAR: 44T (with hub).
30	92402	HUB.	37	102667	PINION: 7T; (with hub).
33	92406	SHAFT (with gear).	33, 37	102668	GEAR: 40T; (with hub).
32	92407	BLOCK, terminal.	32	102669	PINION.
32	92408	TERMINAL BLOCK ASSEMBLY.	35, 36	102774	BELT.
29	92410	KNOB.	31	103230	LINE CORD ASSEM- BLY: 2-conductor.
29	92413	KNOB.			
30	92415	SPRING, friction.	31	103231	LINE CORD ASSEM- BLY: 2-conductor.
33	92416	SHAFT.			
33	92417	BEARING.	31	103232	LINE CORD ASSEM- BLY: single-conductor.
32	92419	PLATE, stop.			
41	92420	PLATE, base.	31	103233	LINE CORD ASSEM- BLY: single-conductor.
33	92422	BRACKET, contact.	31	103234	CORD (with terminals).
33	92423	LATCH, contact.	31	103235	CORD (with terminals).
33	92425	LEVER.	35, 36	103236	PLUG (black shell).
33	92427	CONTACT (with buffer).	29	103431	GROMMET.
33	92432	LATCH, contact.	37	103539	SCREW.
33	92433	DISK, code.	37	104451	WASHER, lock.
33	92434	DISK, code.		105394	CABLE, motor.

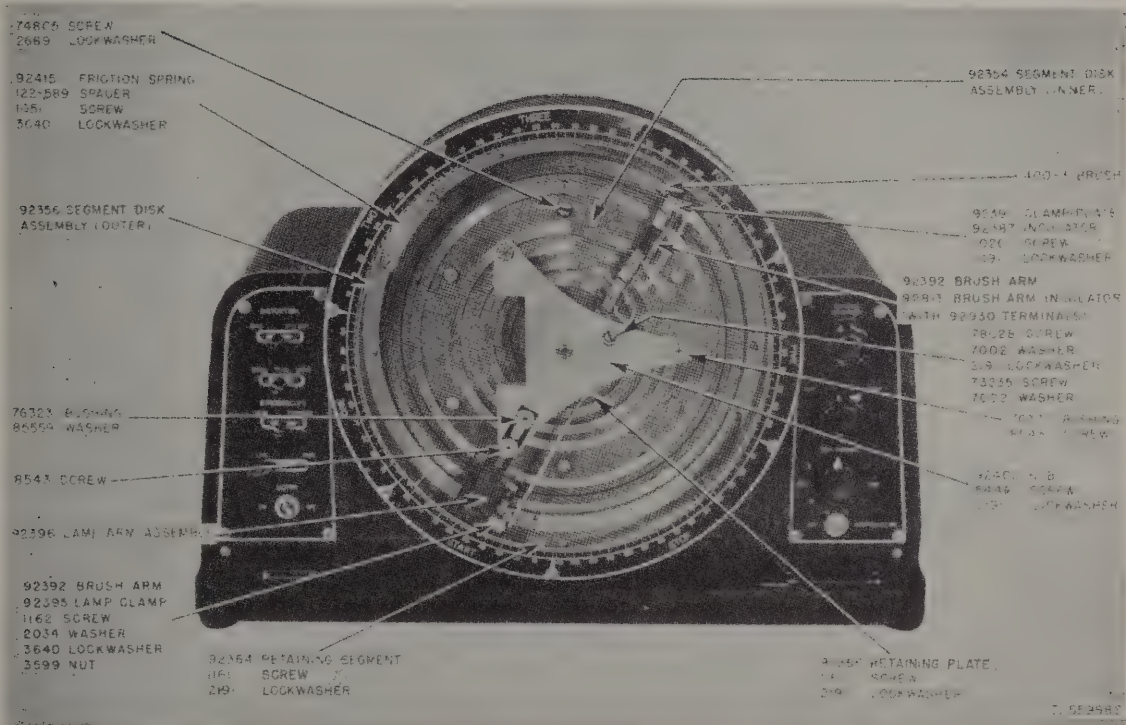


Figure 30. Distortion Test Set TS-383/GG, front view, face plate removed, location of parts.

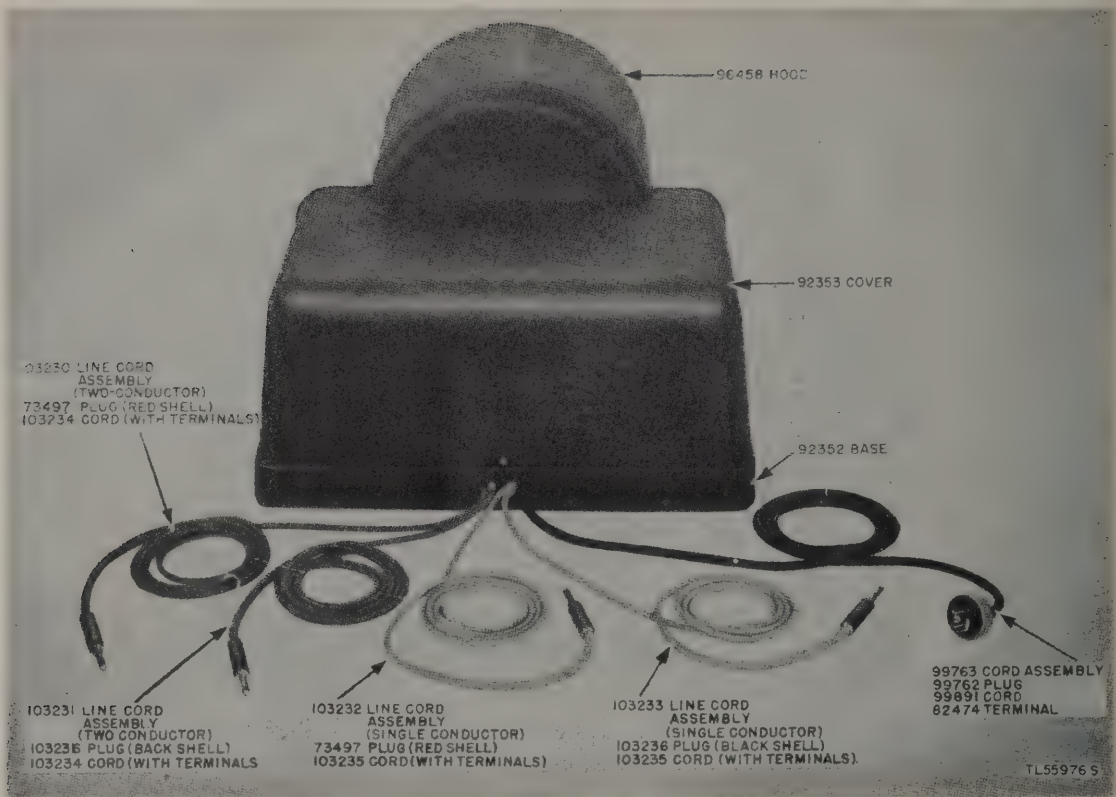
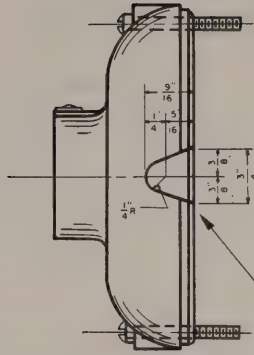


Figure 31. Distortion Test Set TS-383/GG, rear view location of parts.



OLD STYLE 82850 END SHIELDS MAY BE WORKED OVER FOR USE WITH NEW STYLE MOTORS BY ADDING WIRE OUTLET HOLE AS ILLUSTRATED.

82850 END SHIELD HAS BEEN REDESIGNED BUT RETAINS ITS ORIGINAL PART NUMBER. THE NEW STYLE END SHIELD (WITH WIRE OUTLET HOLE) CAN ALSO BE USED ON THE OLD STYLE MOTORS. THE OLD STYLE END SHIELD (WITHOUT WIRE OUTLET HOLE) CANNOT BE USED ON NEW STYLE MOTORS UNLESS IT IS WORKED OVER AS ILLUSTRATED ABOVE.

90263 WOUND STATOR (WITH BASE) HAS BEEN REDESIGNED BUT RETAINS ITS ORIGINAL PART NUMBER. WHEN REPLACING AN OLD STYLE STATOR (WITH TAPPED HOLES FOR THE END SHIELD CLAMPING STUDS) WITH A NEW STYLE STATOR (WITH BODY HOLES FOR THE END SHIELD BOLTS) THE FOLLOWING NEW STYLE PARTS SHOULD BE ORDERED:

90263 WOUND STATOR (WITH BASE).....	1
82850 END SHIELD.....	1
(OR WORK OVER OLD STYLE END SHIELD)	
103431 GROMMET.....	1
102774 BOLT.....	2
W-6104 NUT.....	2

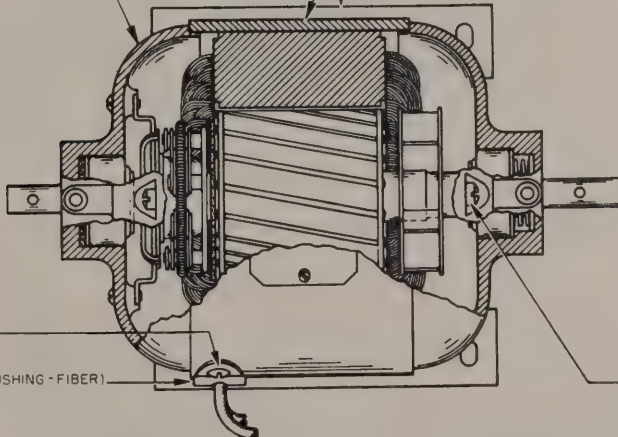
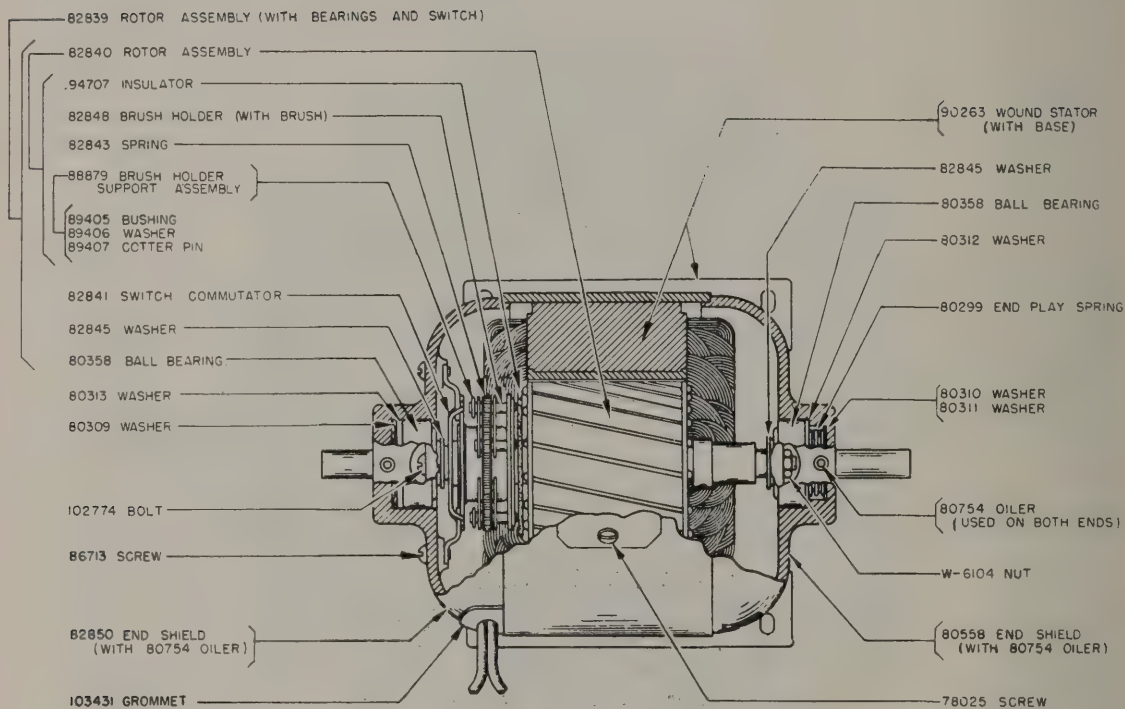


Figure 34. Synchronous motor, old style, location of parts.

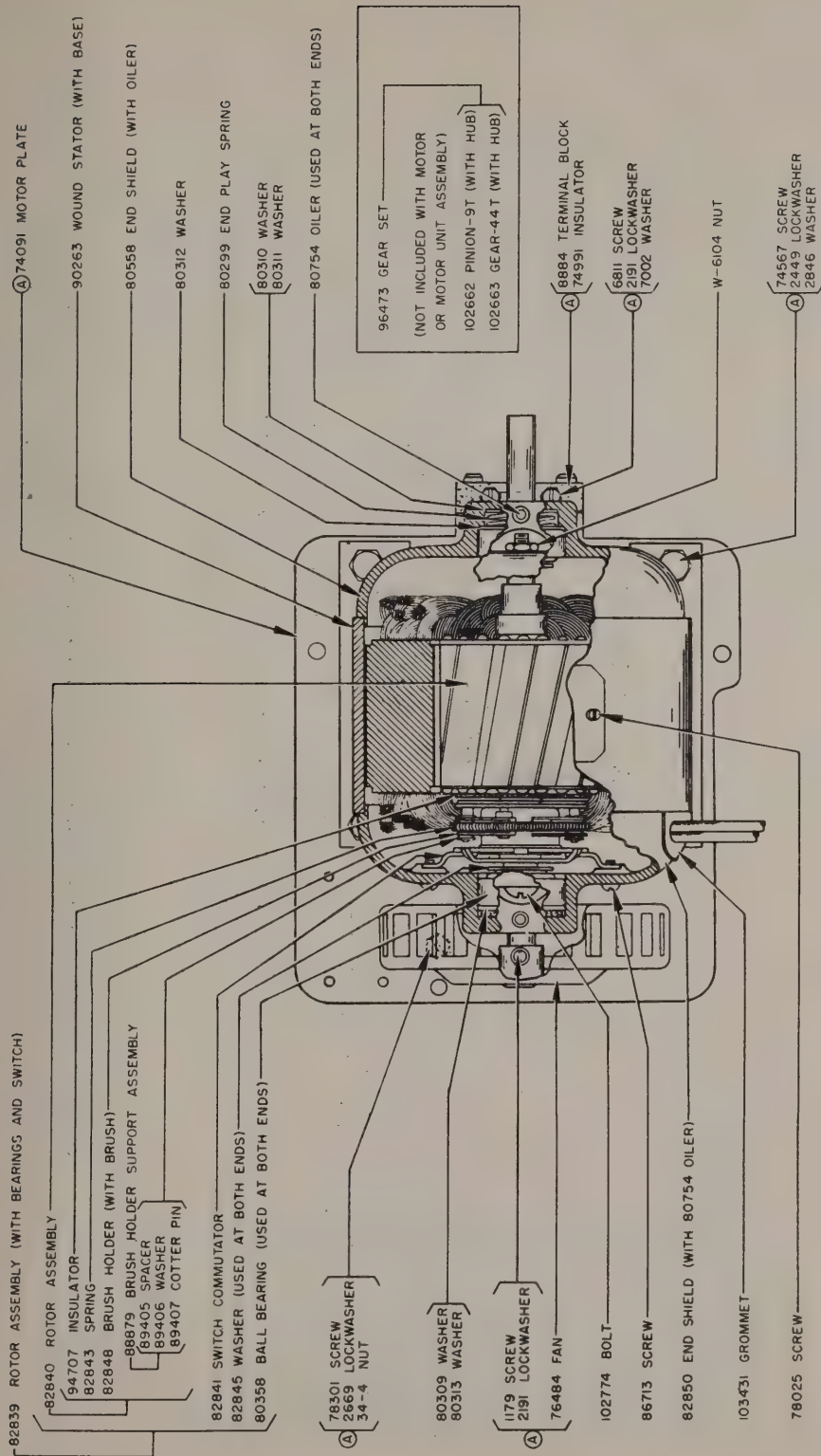
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82283 SYNCHRONOUS MOTOR

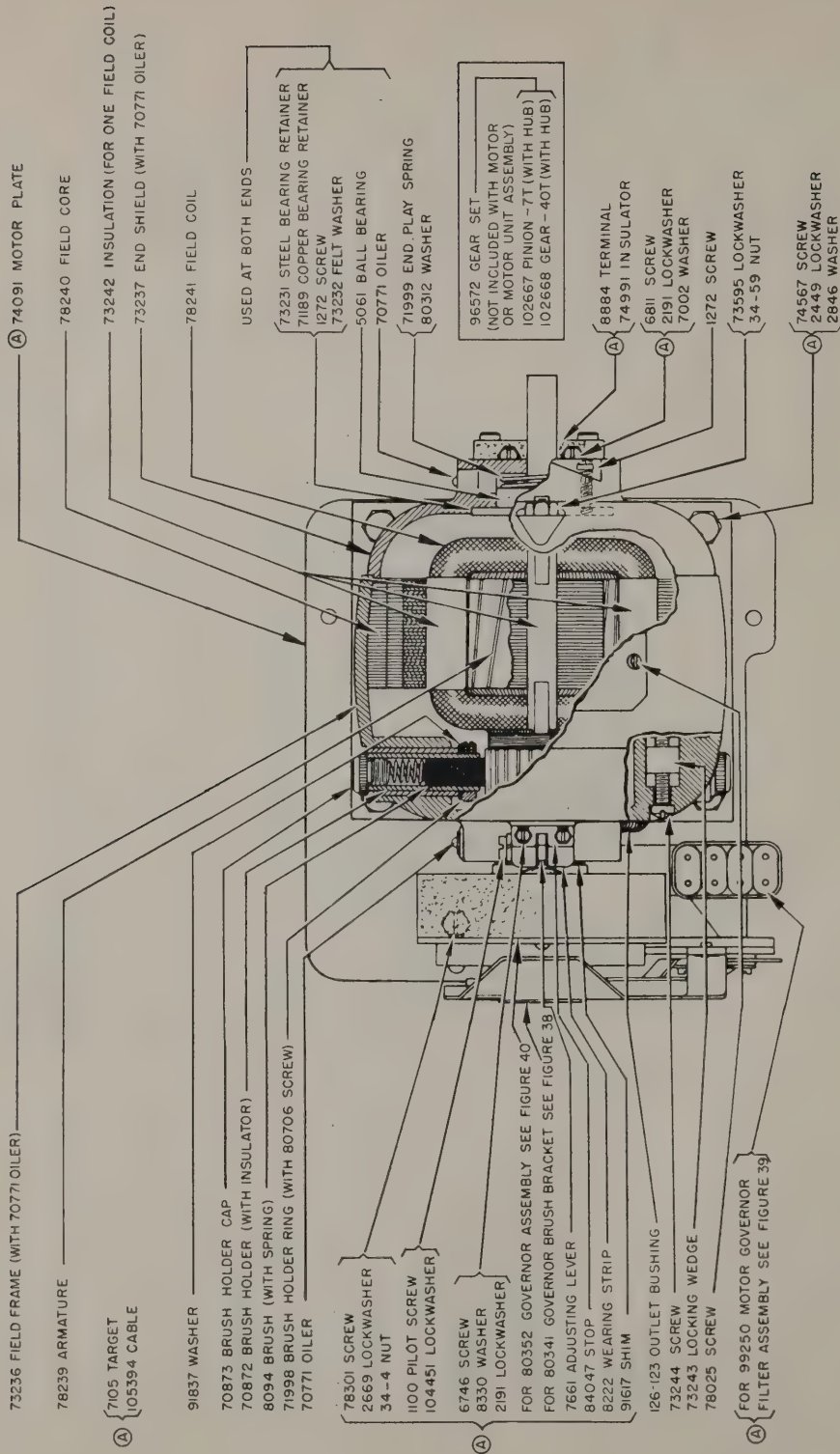
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Figure 35. Synchronous motor, new style, location of parts.



82283 SYNCHRONOUS MOTOR (EXCLUDES PARTS MARKED (A))
MU4 MOTOR UNIT ASSEMBLY (INCLUDES 82283 MOTOR AND PARTS
MARKED (A))

Figure 36. Synchronous motor and motor unit assembly, new style, location of parts.



77953 MOTOR (EXCLUDES PARTS MARKED A)

MU26 MOTOR UNIT ASSEMBLY (INCLUDES 77953 MOTOR AND PARTS MARKED A)

Figure 37. Governed motor and motor unit assembly, location of parts.

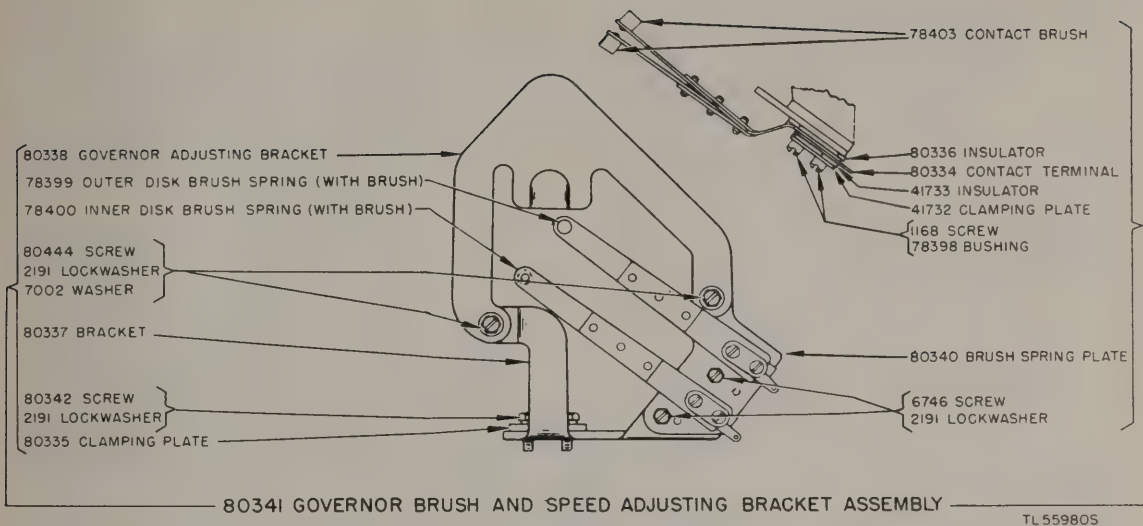


Figure 38. Governor brush and speed adjusting bracket assembly, location of parts.

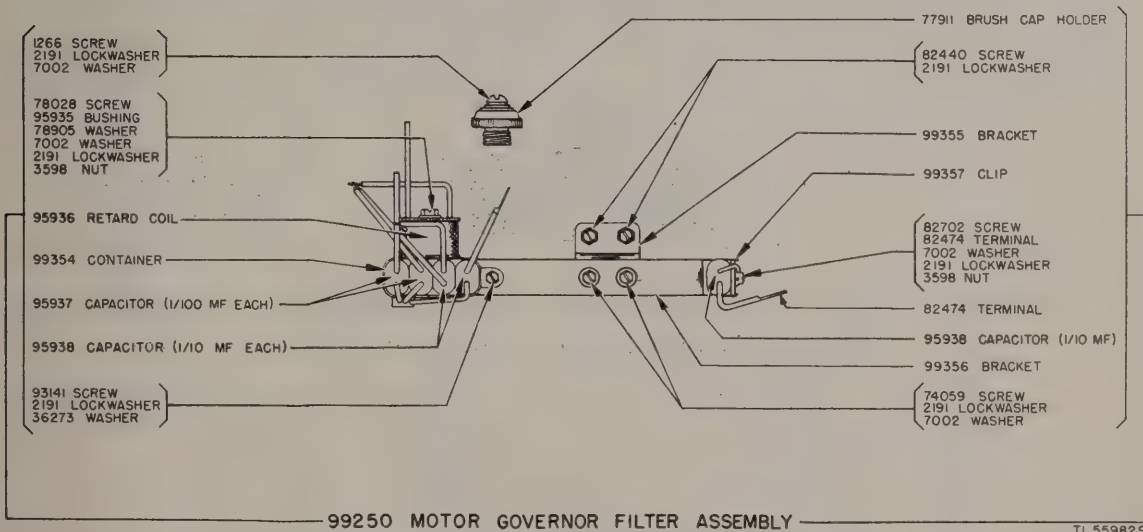
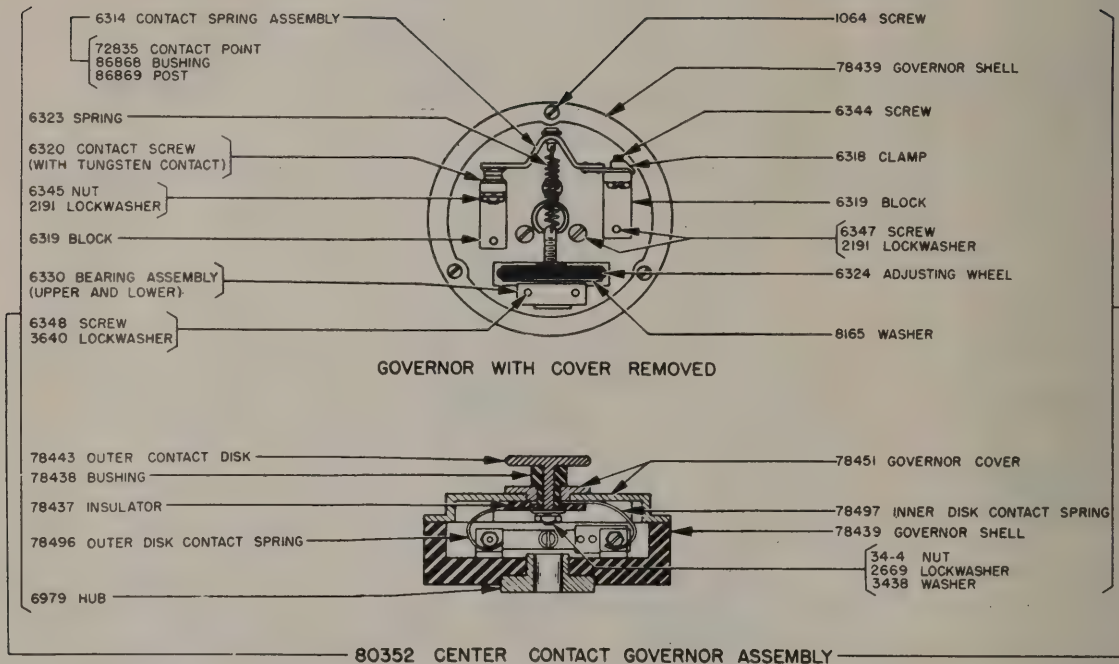


Figure 39. Motor governor filter assembly, location of parts.

6811 SCREW
2191 LOCKWASHER
FOR MOUNTING GOVERNOR

7105 TARGET



TL 55983S

Figure 40. Center contact governor assembly, location of parts.

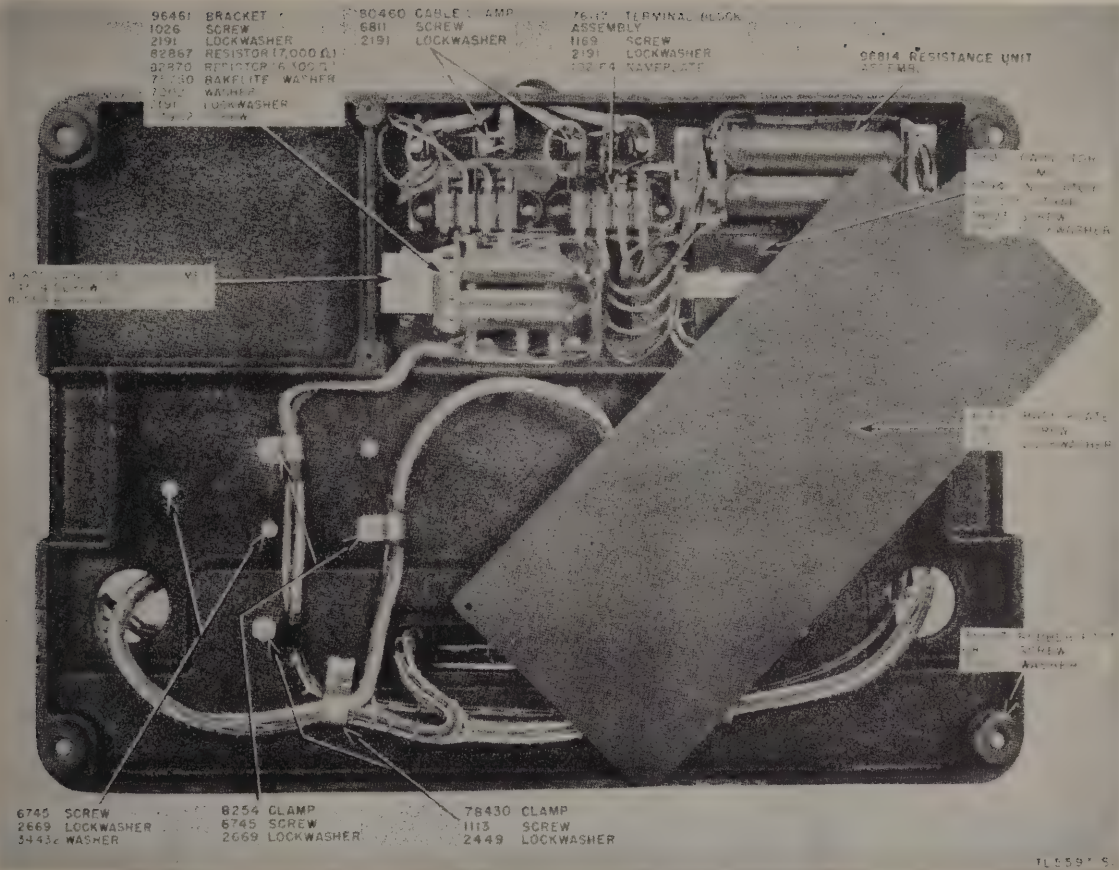


Figure 41. Distortion Test Set TS-383/GG, bottom view, location of parts.

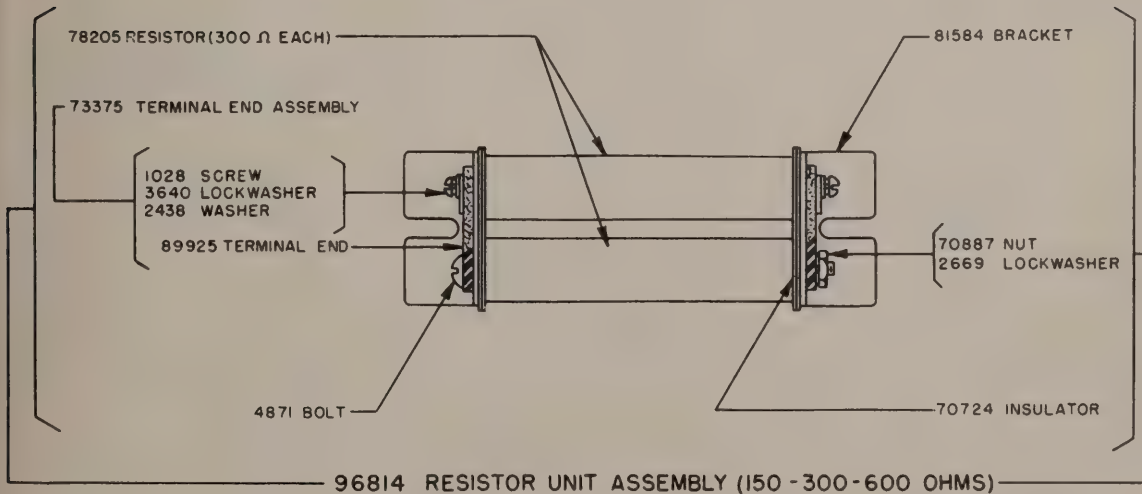


Figure 42. Resistor unit assembly, location of parts.



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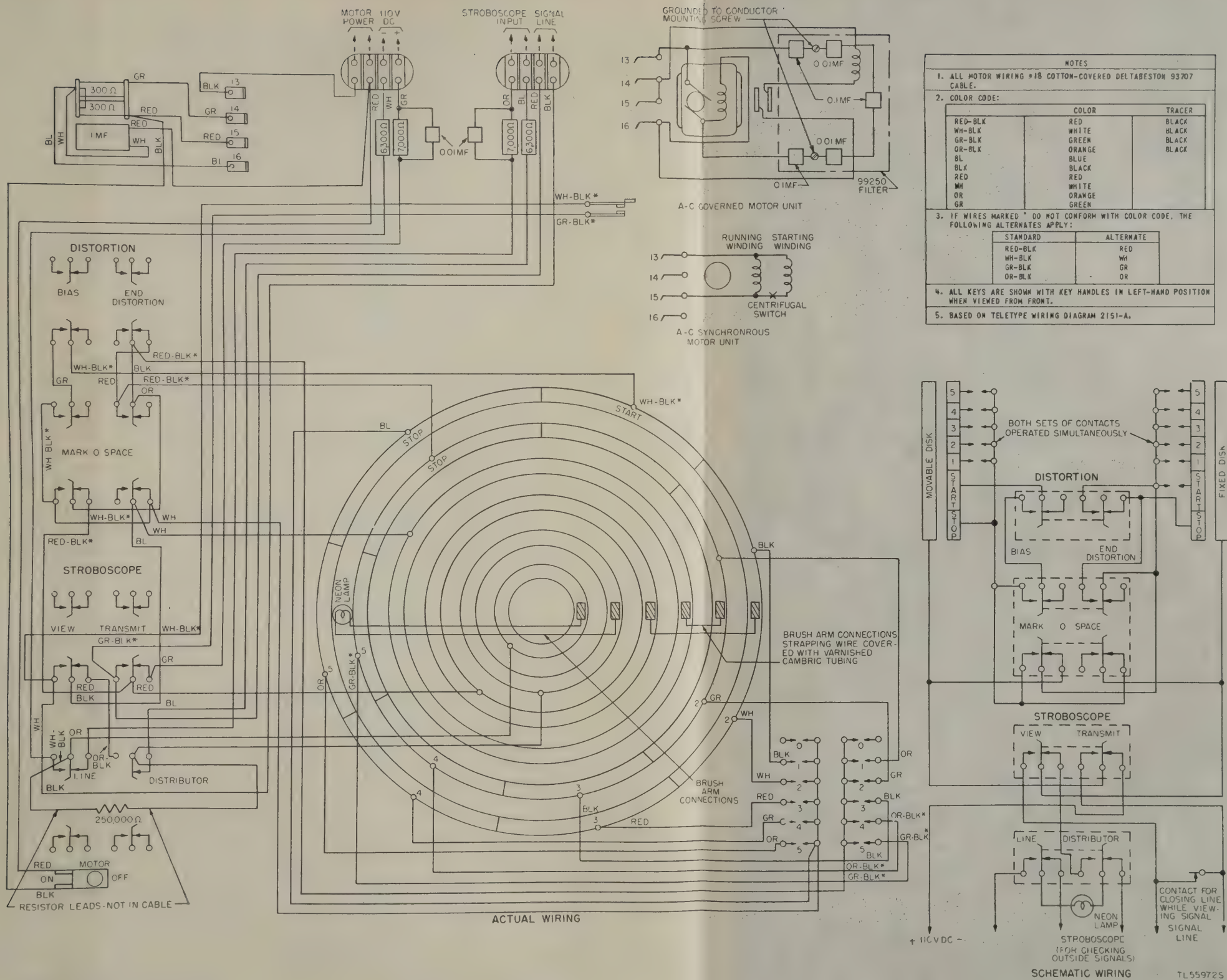
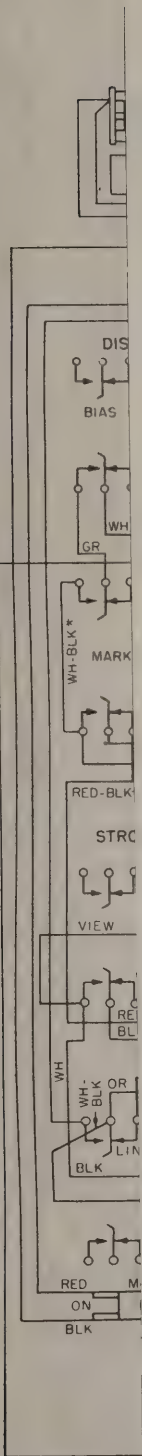
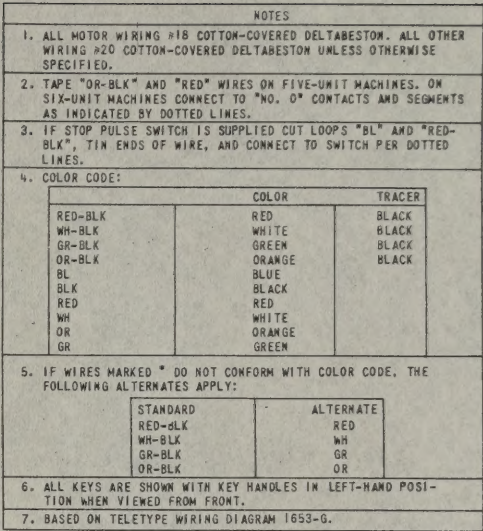


Figure 43. Distortion Test Set TS-383/GG, wiring diagram.

RED-BLK*





TL55973S

INTERNATIONAL HARVESTER CO

Part No. 261205 R11

JAN 6 1956
JAN 18 1956

JUN 18 1956

TM11-2217-3